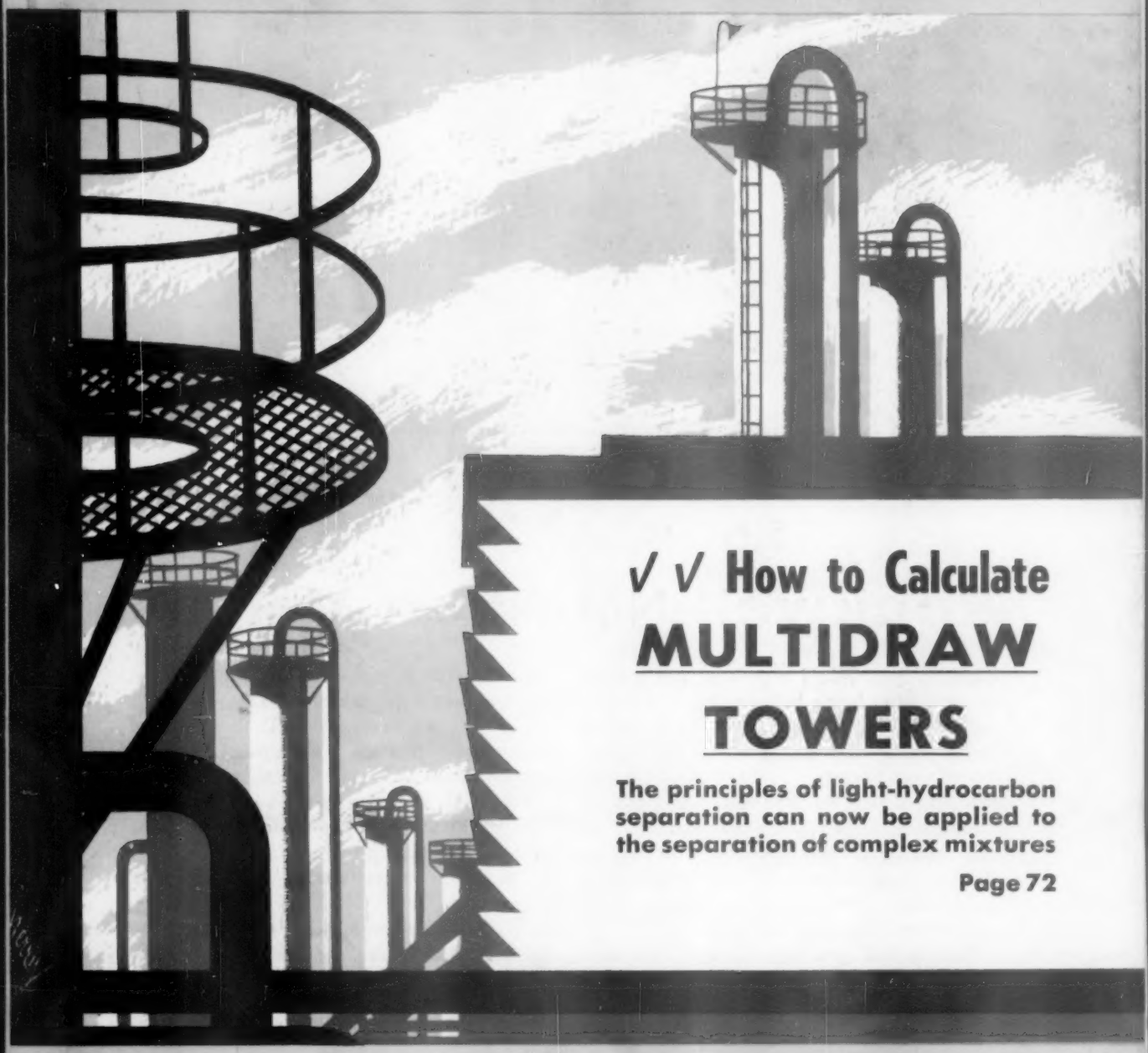
MAY 2, 1955

the OIL AND GAS JOURNAL



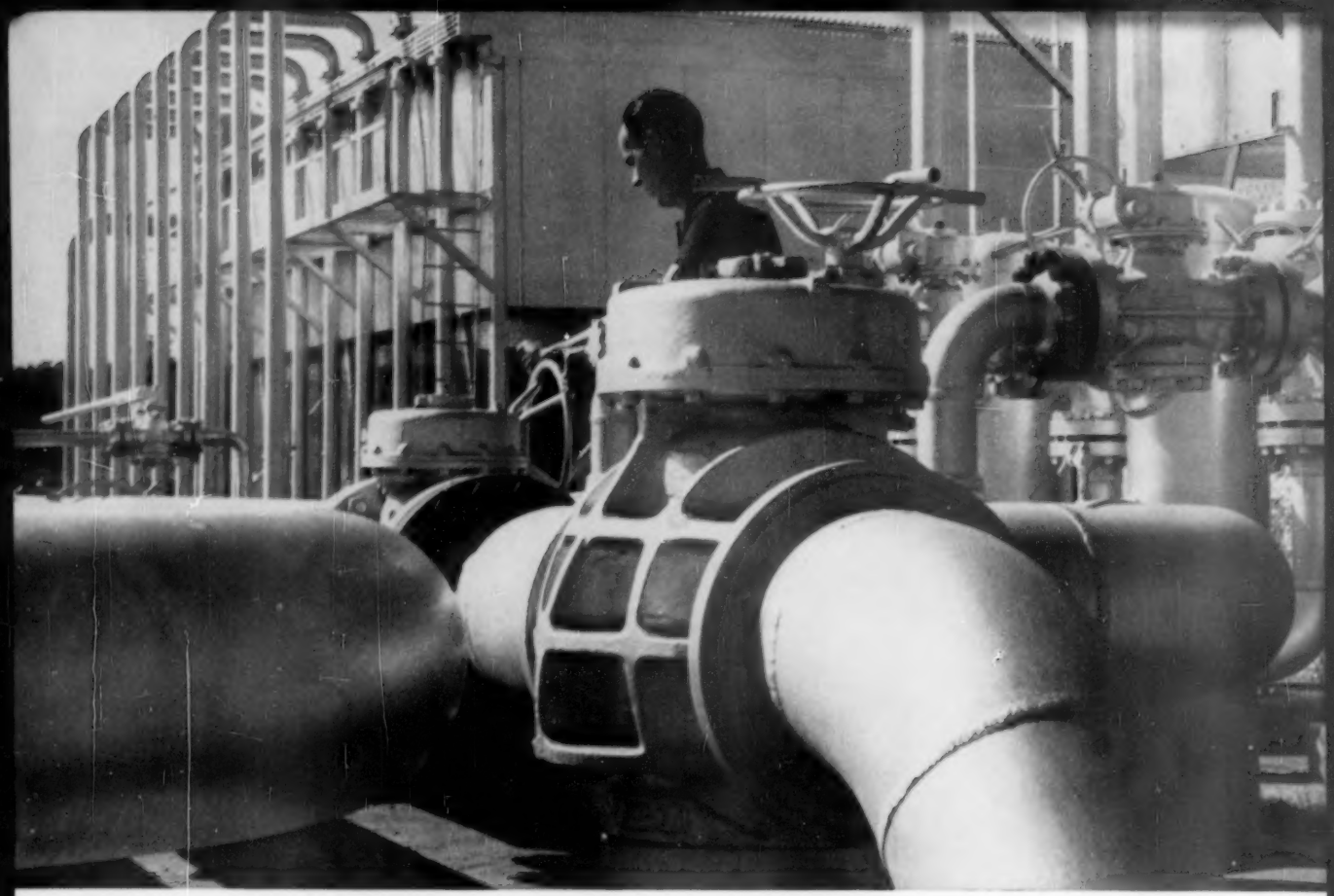
✓✓ How to Calculate MULTIDRAW TOWERS

The principles of light-hydrocarbon separation can now be applied to the separation of complex mixtures

Page 72

REFINERY PROCESSING DEALS . . . *Are they here to stay?*

• **A special Journal report. P. 50**



Positive Shut-Off · Fast, Smooth Closure
Low Maintenance

Rockwell-Nordstrom Valves

For forty years, field experience has proven that you can't buy a better valve than Rockwell-Nordstrom. Pressurized lubricant sealing assures positive shut-off because the seal doesn't depend upon uncertain metal-to-metal closure. The *tapered* plug seats perfectly, and can be hydraulically jacked for *instant* operation. And facts and figures in hundreds of refineries, gasoline plants and petrochemical plants prove that lubrication saves money by cutting repair, replacement and down time costs.

Wrench and gear operation is fast and smooth with Nordstroms because the plug requires only a quarter-turn for closure and it glides on the lubricant film. Their speed and ease of operation make them ideal for automation or remote power operation, too.

Rockwell-Nordstrom is *the original and only complete line* of lubricated plug valves. There is a size, pressure-temperature rating and pattern to fit your needs. Write for more information today: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee: Peacock Brothers Limited.*

ROCKWELL-Nordstrom VALVES

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

PAGE 1 ONE . . . *a glance ahead*

A 96-channel microwave system will be built from Oklahoma to Houston. The system will have far greater capacity than any previously considered in the oil industry. Two major pipeline companies will build the system and use it on a share basis. Specifications are so demanding that some suppliers are reported refusing to bid.

Isomerization of n-pentane to iso-pentane promises to become important in making gasoline. Principal source of pentane feed stock would be natural gasoline. Catalytic reforming is ideally suited to this operation, and a simple, low-pressure, single reactor unit will do an excellent job.

Refiners finding it necessary to slug more reformate to gasoline because of the octane race may be overlooking a lucrative outlet for some specialty aromatics. The basics like benzene, toluene, and xylenes are already well established. But the heavier aromatics may be coming into their own. Keep an eye on some of the C_9 and heavier fractions which might be separated economically for a fancy, if limited, market.

The preignition problem has sparked a new interest in automotive laboratories. Several big companies are building new labs, and existing ones are being expanded all over the country. New emphasis on engine-combustion study is being matched with added importance given to actual road testing. The result will be much-needed data on the effects of octane and other gasoline characteristics on engine deposits and other problems.

Little drilling off the California coast is expected in the next year or so. California companies are optimistic that legislators will soon open the state tidelands to leasing and development. But filled islands, rather than platforms or barges, probably will be required in most work, further delaying actual start of drilling.

Use of vapor-recovery systems is spreading from California to West Texas. One Texas operator already has installed systems on three tank batteries. He is finding that crude-oil gravity is maintained, the recovered vapors enrich the casing-head gas, and savings indicate a payout on the installation in a year or less.

the OIL AND GAS JOURNAL

MAY 2, 1955 • VOLUME 53 • NUMBER 52

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave.
Phone 3-6291

Kenneth B. Barnes ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
C. O. Willson ..... Consulting Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
Neil Williams ..... Associate Editor
Norman S. Morrisey ..... Drilling-Development Editor
Robert G. Deering ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
W. A. Franklin ..... Assistant to Presentation Editor
Carl Hoot ..... District Editor
Carl J. Lawrence ..... District Editor
John C. McCaslin ..... District Editor
John M. McGivern ..... District Editor
Joe Reilly ..... District Editor
W. A. Bachman ..... District Editor
LaWanda Turner ..... Readership Research
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
C. Dudley Johnston ..... Art Director
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber ..... Refining Editor
Dahl M. Duff ..... International Editor

HOUSTON OFFICE
802 Sterling Building
Phone CHarter 4626

F. Lawrence Rosen ..... District Editor
Edwin McGhee ..... District Editor
Paul Swain ..... District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone STerling 3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; and Casper, Wyo.

The Oil and Gas Journal, Published Mondays, copyright 1955, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

IN THE NEWS

Are Refinery Processing Arrangements Here to Stay? 50
I.P.A.A. To Continue Fight for Imports Quota 54
1955 Total Demand Set At 8,474,000 Bbl. by I.P.A.A. 55
Nation's Octane Ratings Still Climbing 56
Crude-Producing Capacity Gain of 473,000 Bbl. Seen 57
Importers Virtually Alone in Income Gains in 1954 57
Cost of Finding Crude Still Going Up, I.P.A.A. Says 58
Needed in Next 50 Years: 990 Billion Barrels of Oil 58
Trans-Canada Gets Extension of Permits 60
First Big Gas Flow Reported in Northwest Territories 60
Trans-Canada Officials Seek Gas Outlet in Montreal 61
Private Companies Take Over Three Rubber Plants 61
Two Pre-Permian Discoveries Hit in Texas Panhandle 62
Neely Amendment Fight Near Climax in Senate 63
Gas Users Make Effective Point in Plea for Controls 64
National Stockpile of Synthetic Rubber Proposed 65
California Water-Flood Problems May Be Over 66
Governor Knight Signs California Conservation Bill 67
Free-World Production Hits New Record 68
Exploration in Argentina Opened After 20 Years 69
Cuba Has Bright Future as Refining Center 70
Shell Maps Exploration Program in New Zealand 71

EXPLORATION FEATURES

Among the Drilling Contractors 123
Center of Gravity Shifts in Montana 141
Downdip Drilling Finds New Reserves 142
Exploration Highlights 144

DEPARTMENTS

They Say 35
Calendar of Events 40
Journally Speaking 45
Editorial 47
This Week 49
Watching Washington 65
International News 68
Pipeline Patrol—Construction 117
Equipment Digest 127
Trade Literature 131
Equipment Men in News 137
Personals 163
Deaths in the Industry 165
Statistical Summary 166
Drilling Statistics 167
Supply Statistics 168
Refining Statistics 169
Demand Statistics 170
Classified Advertising 171
Advertisers' Index 175

EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING
OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS

. . . an integrated magazine serving an integrated industry

TECHNOLOGY—OPERATION

How to Calculate Multidraw Towers 72

By N. H. Prater and C. W. Boyd

The principles of light hydrocarbon separation may be modified for calculating multidraw towers. The separation of crude oil into gasoline, kerosine, and other products in a crude-oil topping plant is relatively easy compared to the separation of hydrocarbons of 95 percent purity and higher. As a result the design of a crude-oil topping tower is usually based on rule-of-thumb methods. This article shows how the principles of close separation can be adapted to multidraw crude-oil fractionating towers. The authors outline a 21-step procedure for stepwise calculation of these towers. The Fenske method of obtaining minimum number of trays of total reflux, the Scheibel-Montross method for calculating minimum reflux rate, and Gilliland correlation between reflux rate the number of theoretical trays are used.

Inverted Emulsion Drilling Mud for Dirty Sands 83

By M. D. Nelson, B. C. Crittendon, and G. A. Trimble

Magnolia Petroleum Co. has developed an inverted emulsion mud that can be used under almost all drilling conditions. It is composed of water-base mud, refined oil or stabilized crude, and suitable emulsifiers. The mud has been used a total of 75 times to drill into pay formations, core, complete, and workover. Field control of the mud is simple. It is based on measurements of viscosity, filter loss, and emulsion stability. This latter can be simply measured.

Modernizing Obsolute Pumping Equipment 93

By Frank Poorman

Results of a study of Healdton field show that modernization of 249 wells increased production 10.4 per cent. This increase was registered while the number of operating wells was reduced 27 per cent. Operating costs were reduced 45.6 per cent. In the program Shell replaced 20 to 40-year old rod-line central powers or rig fronts with electric-motor-driven unit pumpers.

Determining Operating Pressures in a Closed Products System 100

By Frank G. Hangs

Here is a graphic method for determining operating pressures at various points in a closed products system. In normal operation, consignments may be taken off at several points in the system and at different rates of flow. At other times, delivery may all be made at one or two points. For most efficient operation pressure levels at various takeoff points should be known. This method accomplishes this purpose.

Modern Drilling Rig in Museum 101

A 22-ft.-high detailed modern drilling rig, complete down to even some typical rig noises, is being displayed.

O.T.J.-Plants: Maintenance Short Cuts 103

By F. Lawrence Resen

The Seeligson cycling plant, Jim Wells County, Texas, is operating at lower costs and with higher on-stream factor as a result of new ideas in the maintenance program. Heat-exchanger maintenance has been speeded up by using knockdown scaffolding and a special frame for pulling tube bundles. Dehydrators are operated more efficiently as the result of checking with a pair of calibrated measuring tanks.

REGULAR FEATURES

Nelson's Refinery Construction Index	101
Engineering Reference Section	107-114
Foreman's Page	107
Questions on Technology	109
Engineering Fundamentals	111
Refiner's Notebook	113
Modern Drilling	114

WITH THE

"ZC"

You can mount a Fairbanks-Morse "ZC" engine on your pumping jack the way you want it. Clutch and sheave can be mounted on either side of the engine *without sacrifice in efficiency, smoothness or balance.* With the famous Fairbanks-Morse extra-heavy, large double flywheels, there is always one flywheel between engine and load. You get perfect balance, poised or rolling . . . smoother, more efficient, more economical operation.

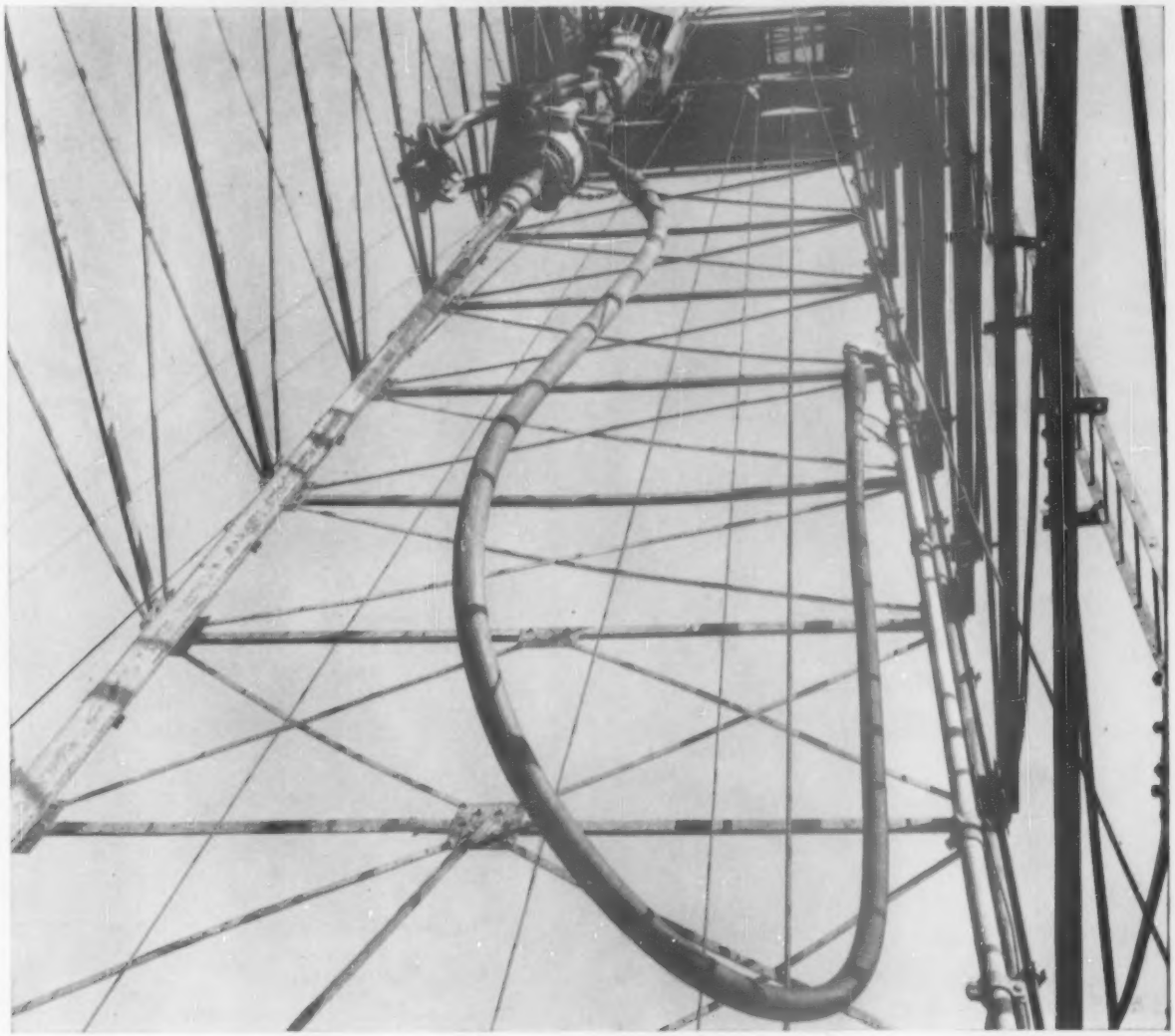
There is a type and size "ZC" engine to exactly fit your requirements. See your local supply store or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the best

OIL FIELD EQUIPMENT · PUMPS · SCALES · ELECTRIC MOTORS · GENERATORS · LIGHT PLANTS · DIESEL, DUAL FUEL & GASOLINE ENGINES · MAGNETOS · DIESEL LOCOMOTIVES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Most flexible hose made for heavy-duty service

FOR all its toughness, B. F. Goodrich Highflex hose is the most flexible one made for heavy-duty service. It's easy to attach to the rig, hangs well from the standpipe, coils easily without kinking. And there's no dead weight to drag when Highflex is moved on or off the job.

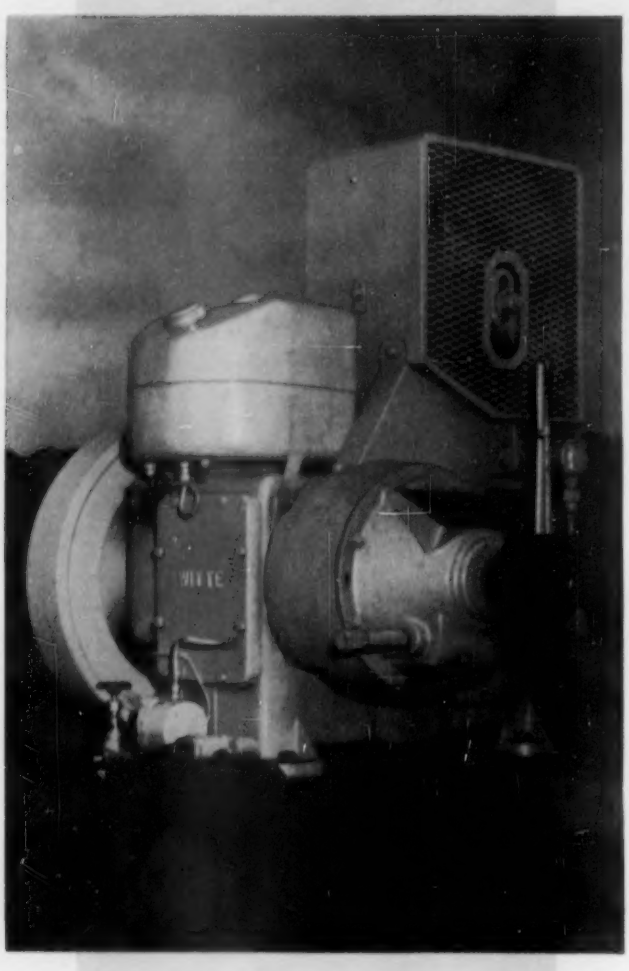
In addition to easier handling, this B. F. Goodrich hose has all the strength it takes to handle extreme bottom hole pressures. Spiral-wrapped cable wires make it resistant to bursts, qualify it for Grade C (5000 lb. test pressure) American Petroleum Institute. Extra layers of wire and fabric on the hose ends protect against bending stress. Extra strength here means extra safety for your crew and rig—no hose blowouts at the coupling.

The thick, tough cover on Highflex resists gouges, scrapes, tears. Sun, wind and rain will not harm it. Oily mud will not cause swelling or rotting of the tube

This longer-lasting hose is available at leading supply stores. And here's something to remember. When emergencies make service the *first* consideration in buying hose, you can get the replacement you need any time of day or night at one of these B. F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Williston, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *The B. F. Goodrich Company, Dept. M-400, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

A GOOD DECISION



...the day you installed a Witte Engine

And here's why—

It's modern

Precision engineered

Condenser-type cooling

Counterbalanced crankshaft

Wet-type, replaceable cylinder liner

Low center of gravity

Standard safety controls

Simple to operate

Service accessibility

Every day, you see more and more Witte Engines—everywhere.

WITTE ENGINE WORKS

Oil Well Supply Division • United States Steel Corporation
1609 Oakland Ave., Kansas City 26, Mo.

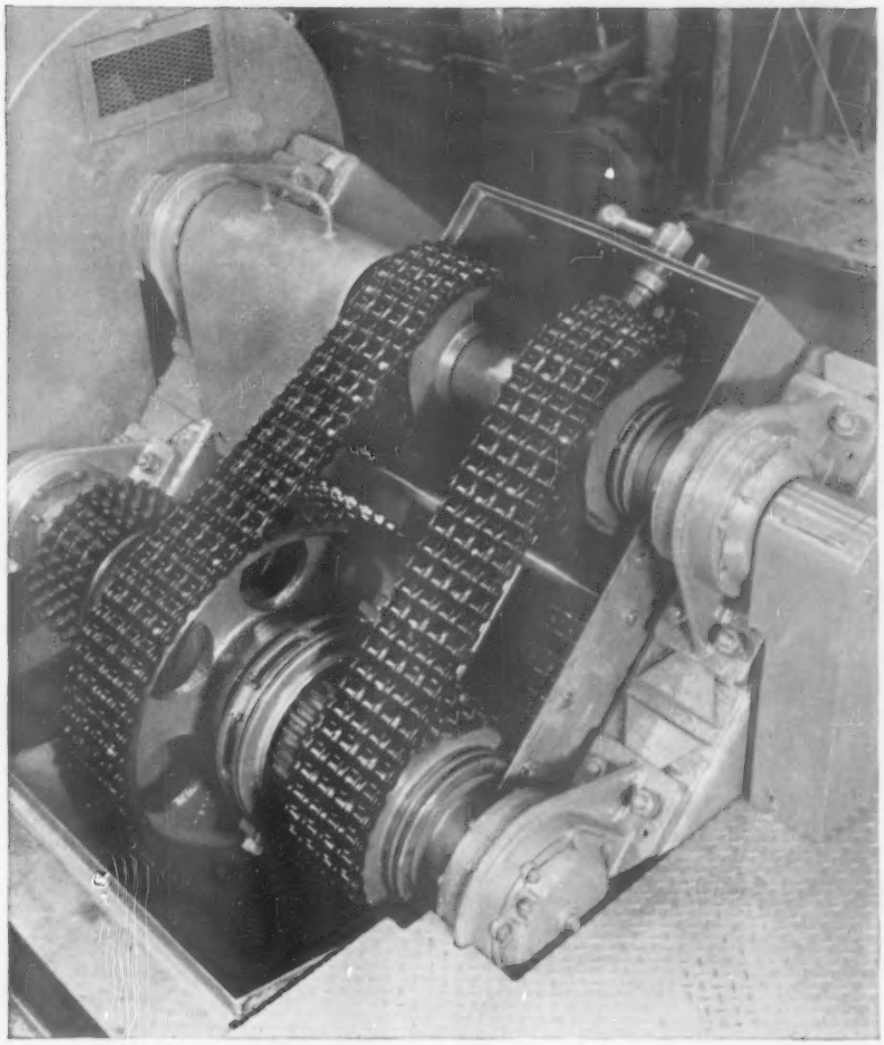
Gas-gasoline Models from 3.8 to 15.5 hp.

Full diesel Models from 3.75 to 12.5 hp.

USS

WITTE ENGINES

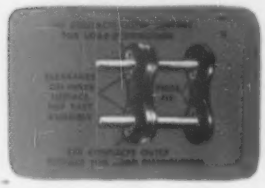
UNITED STATES STEEL



Link-Belt Precision Steel Roller Chain on two-speed pump drive of 5-section drive group on National Supply Company's No. 160 Rig in service on a drilling barge.

SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

SHEPHERD'S CROOK COTTERS will remain in place under severe operating conditions.



FASTER COUPLING and uncoupling of multiple-width chain with E-Z Assembly.

PRE-STRESSING of multiple width chain provides uniform load distribution.

How these LINK-BELT EXTRAS

increase roller chain service

ON drilling rigs or any other demanding power transmission job, manufacturing extras used in making Link-Belt Precision Steel Roller Chain show up in longer-lived, more efficient performance. That's been proved in oil service throughout the country . . . on the toughest drive applications in the field.

1. **LONG LIFE**—Added refinements like those shown above assure longer life.

2. **LOW MAINTENANCE**—High resistance to wear eliminates frequent adjustments.

3. **HIGH EFFICIENCY**—Positive action is independent of atmospheric conditions. No power is lost through slippage or excessive bearing friction.

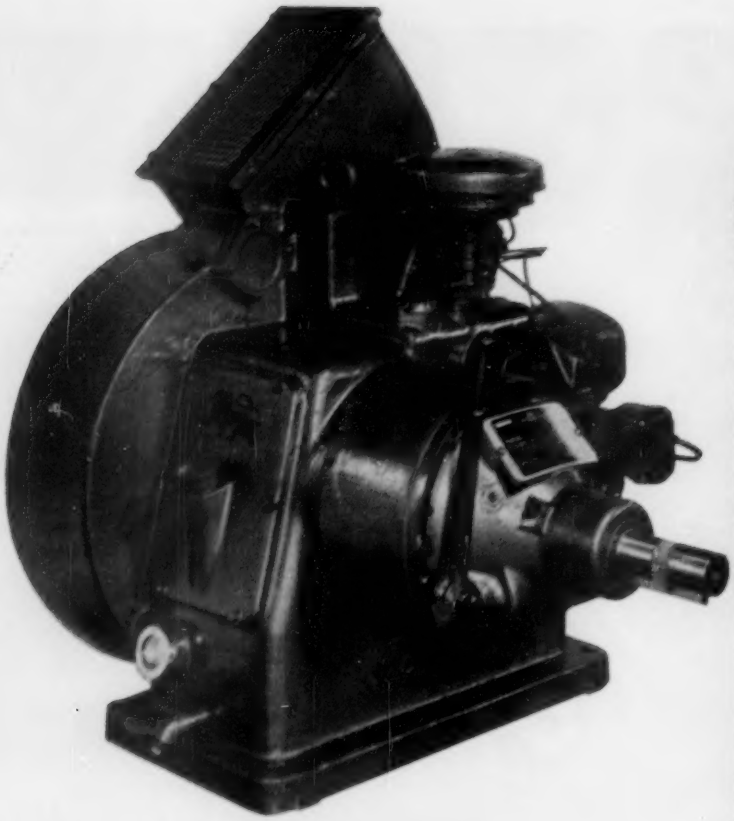
Link-Belt makes a complete range of Precision Steel Roller Chain—single and multiple widths—and sprockets through 3" pitch. You can get a specific answer to your requirements through your nearest Link-Belt office, or any leading supply store.

13,813-R

LINK-BELT

ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.



New LeRoi A114 Pumping Engine

A single-cylinder, valve-in-head engine with 114 cu. in. displacement, built specifically to give you economical operation with little attention.

Here it is — an engine that can pump more oil than any other engine of equal displacement. You can run it two weeks at a time without inspection, because the patented "vaporizing condensing" cooling system seldom needs make-up water. Moreover, a generous crankcase permits long intervals between oil changes, and there are no grease fittings, belts, or other accessories to need attention.

Performance is only half of the A114 story— the other half is dependability. Here are a few of the features that give the A114 its stamina:

The A114 operates on natural gas or LPG.

Get all the facts about this new 14.5 hp pumping engine from your supply house or your Le Roi distributor. Or, write for our latest bulletin E-8.

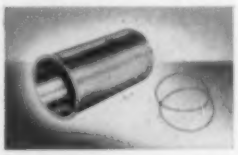
Two extra large flywheels provide generous WR2 values for smooth, constant-speed pumping even with unbalanced loads.

Valve-in-head design produces maximum power with minimum fuel consumption. Short stroke design reduces piston speed and lessens cylinder wear.

Short, counter-balanced crankshaft, 3" in diameter, has extreme overlap between crank pin and main bearing journals for added strength and rigidity.

Heavily constructed and internally ribbed, integral crankcase and base eliminate any possibility of distortion.

One-piece fan and flywheel is totally enclosed in a specially built air duct. No fan or belt to maintain or replace.



Removable, wet-cylinder sleeves assure easy, low-cost replacement of cylinder wearing surface.

LE ROI *Division of Westinghouse Air Brake Co.*

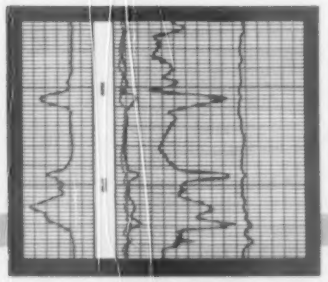
Milwaukee 14, Wisconsin

Oilfield Headquarters: Tulsa, Okla.

PORTABLE AIR COMPRESSORS • TRACTAIR • STATIONARY AIR COMPRESSORS • AIR TOOLS • ENGINES

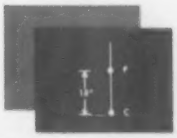
P-128

LOGS MULTIPLE CURVES ON *ONE* CURRENT CIRCUIT

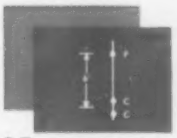


FM SYSTEM GIVES COMBINATION OF CONFIGURATIONS
WITH SAME DEPTH REFERENCE

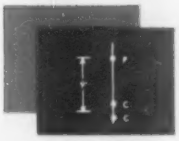
You can always select the best configuration for your well from these electrode curves with set combinations of spacings.



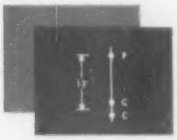
$2Z_{18}$" A widely used two electrode correlation curve with 18" spacing.



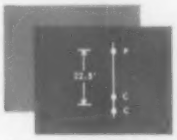
3_iZ_6' A shallow penetration three electrode type arrangement with the electrode log at top of section.



3_iZ_9' A three electrode curve that is frequently used to measure R_i.



3_iZ_{13}' A 3_iZ curve capable of penetrating beyond the invaded zone.



3_iZ_{16}', 3_iZ_{18}', $3_iZ_{22.5}$' or 3_iZ_{27}' Deep penetration three electrode curves with a choice of spacings.

An entire group of curves—all with an identical depth reference less than two feet from the bottom of the tool—can now be logged on a single down-hole trip. Halliburton's Frequency Modulation logging provides this extra-accuracy advantage by placing all active electrode circuits entirely within the tool and controlling the circuits with carrier signals from the surface. The problems of using several formation circuits or commutating the output of one source is entirely eliminated to give you a fast and economical method of obtaining several different curves.

For quantitative analysis and for studies that combine the best features of several different curves, the FM system offers the widest choice of electrode configurations. Two, three or four electrode curves in a variety of spacings are available with correlative curves that may be matched against any offset well. And the use of electronic controls and vacuum tube metering circuits allows built-in calibration, an absolute zero for base values and simultaneous logging of a potential and three apparent resistivity curves.

FM Logging, an exclusive Halliburton service, gives you more data with more accuracy—for only a few cents a foot! For advanced logging techniques that help you most, call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

ELECTRICAL WELL SERVICES

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Announcing...

A New Bethlehem Product

EXPANDED

LINE PIPE

With the installation of facilities for hydraulic expansion well under way at the Steelton, Pa., plant, Bethlehem Steel Company will soon be able to furnish an unusually wide range of welded, large-diameter line pipe to the oil and gas industries. We invite your inquiries.

HIGH-TEST LINE PIPE

Cold expanded, electric-fusion-weld line pipe meeting API 5LX specifications, in diameters from 18 in. to 36 in. Available in 40-ft lengths and in wall thicknesses to ⅝ in. Bethlehem is also equipped to coat pipe exteriors and interiors.

HIGH-STRENGTH PIPE

Pipe fabricated from alloy steels such as high-strength, low-alloy Bethlehem Mayari R steel plate (50,000 yield). This pipe is immediately available as rolled in 40-ft lengths and in wall thicknesses as required. All diameters from 18 in.

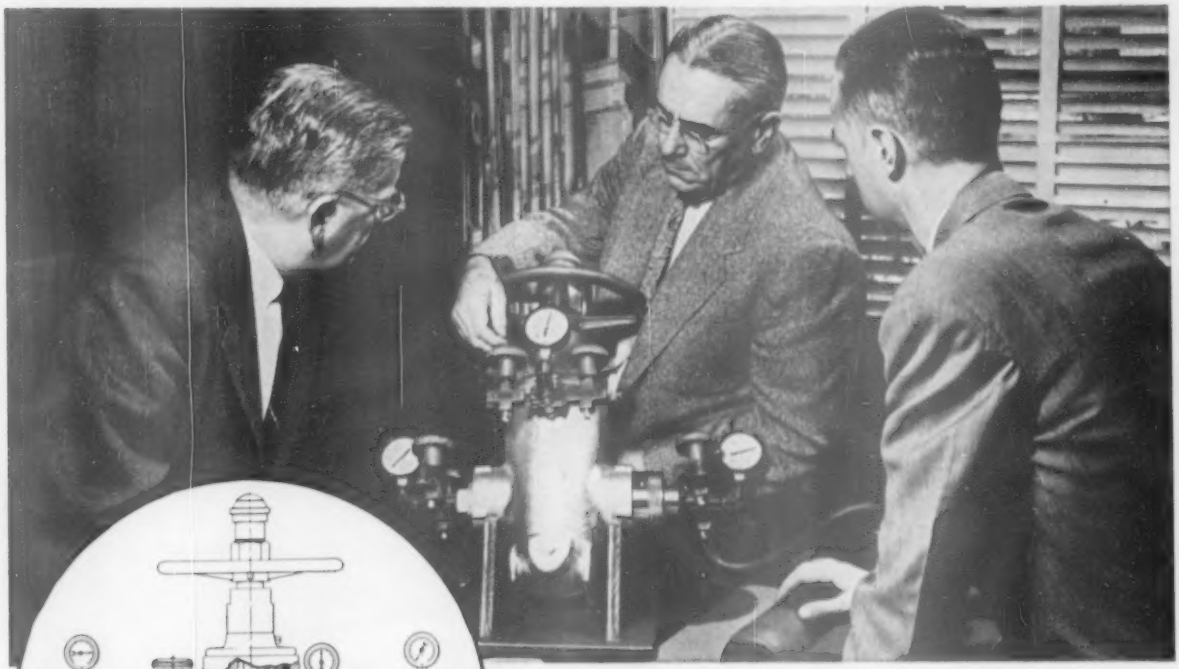
BETHLEHEM STEEL

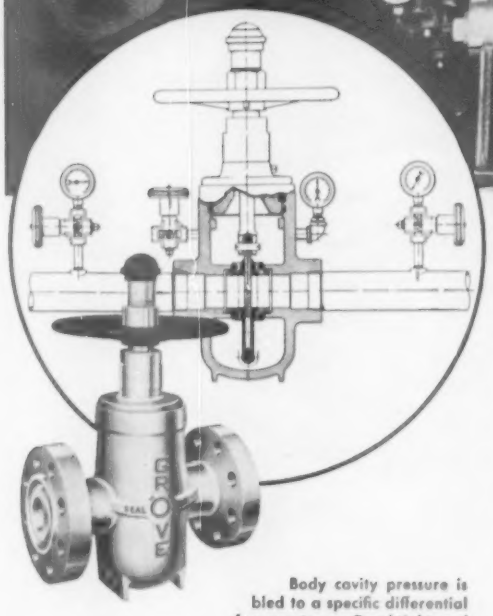
For further information about Bethlehem Oil & Gas Pipe, please contact the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

WE'LL MAKE THIS TEST WHEREVER YOU SUGGEST





Body cavity pressure is bled to a specific differential from upstream. Dead-tight seal is verified by non-variance of cavity pressure gauge.

The only gate valve you can check in the line—any time.

SEE FOR YOURSELF HOW GROVE SEAL-"O"-RING GATE VALVES CAN BE CHECKED IN THE LINE...for positive dead-tight seal and free-moving gate action

Your Grove sales engineer is equipped to demonstrate this new field method of testing and checking the dead-tight seal and free-moving gate action of Grove Seal-"O"-Ring Gate Valves—*right in your office,* or wherever you suggest. Simulating actual conditions, this test proves conclusively that Grove Seal-"O"-Ring Valves hold tight as a line blind, yet permit free movement of the hand-wheel at all times. Also, excess body cavity pressure is automatically relieved *internally* to the upstream line by piston-action of Seal-"O"-Ring seat assemblies, actuated by pressure differential. This test set-up shows how you can install this system for checking Grove valves right in the line—at any-time—without loss of gas or liquid. You must see it—to believe it. Contact your nearest Grove District Office today, to arrange for test demonstration.

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • **LOS ANGELES 6** — 1930 W. Olympic Blvd.

ODESSA, TEX. • TULSA, OKLA. • LAFAYETTE, LA. • CHICAGO, ILL. • DENVER, COLO. • In Western Canada: GROVE VALVE LIMITED

GROVE SEAL RING — GROVE SIMPLICITY ACCURACY SAFETY

At last!

A TRUE VINYL MASTIC!

Complete protection in a single coat—10 mils thick.

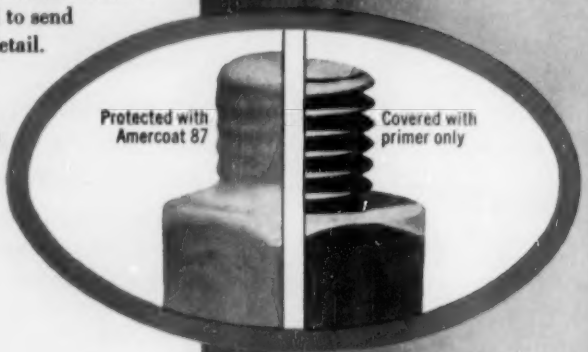
Amercoat No. 87 will cut your maintenance costs because one coat gives you the thickness and protection previously available only through the application of multiple coats.

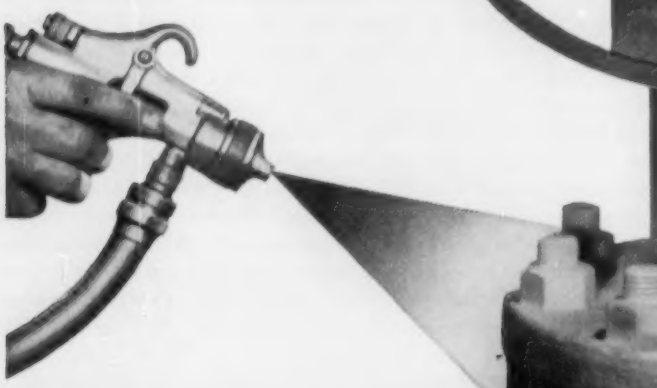
Amercoat No. 87 is the brand new solution to an old problem, for it combines the time-tested chemical and weather resistance of a vinyl with the extra thickness that was heretofore available only in conventional mastics.

Amercoat No. 87 is easily applied with standard industrial spray equipment. Only one cross-spray coat, over a primed surface, is required for complete protection. Because **Amercoat No. 87** is a true vinyl, it is not limited to black, but is available in a variety of colors.

You can save up to 50% of your labor costs with **Amercoat's new vinyl mastic No. 87.** We will be pleased to send you a bulletin describing this new coating in detail.

Notice that the sharp bolt threads, welds and sharp corners are completely protected with one coat of Amercoat No. 87—10 mils thick!





Amercoat CORPORATION

Dept. CE,
4809 Firestone Blvd.,
South Gate, California

EVANSTON, ILL. • KENILWORTH, N.J. • JACKSONVILLE, FLA. • HOUSTON, TEX.

G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Counselor analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *General Electric Company, Communication Equipment, Section X855-2, Electronics Park, Syracuse, N.Y.*

INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

◀ There is a G-E Authorized Service Station near you. Look for this sign.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

Progress Is Our Most Important Product

GENERAL ELECTRIC

USE AXELSON FROM TOP TO BOTTOM

To hold that production

There is an old saying about no chain being stronger than its weakest link . . . and it's true.

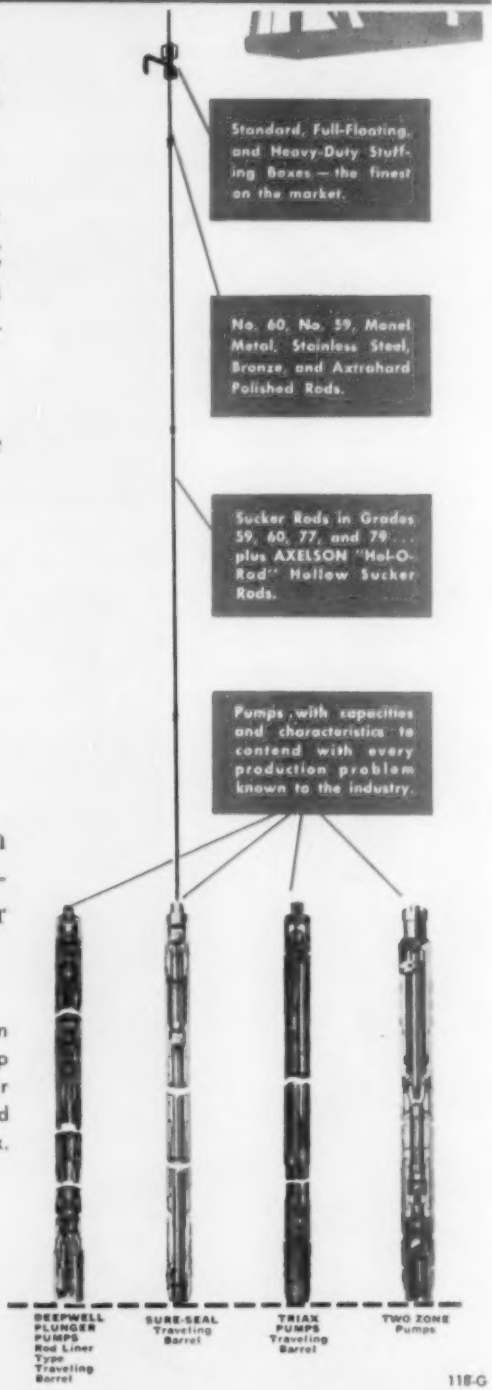
Nowhere, from polished rod to bottom-hole pump, is there a weak link in a well using the right Axelson equipment. You can HOLD that PRODUCTION to the maximum with Axelson.

There is another old adage about experience being the best teacher . . . and it's true.

AXELSON HAS MADE PRODUCTION EQUIPMENT SINCE 1892, and THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY BORN OF TECHNICAL EXPERIENCE.

Tolerate no weak links in your production chain! Confer now with men who understand Axelson teamwork — call your J&L store.

Never junk an Axelson Pump. J&L has a Pump Repair Shop near your production, fully equipped and with parts in stock.


Standard, Full-Floating, and Heavy-Duty Stuffing Boxes — the finest on the market.
No. 60, No. 59, Monel Metal, Stainless Steel, Bronze, and Axtrahard Polished Rods.
Sucker Rods in Grades 59, 60, 77, and 79 . . . plus AXELSON "Hol-O-Rod" Hollow Sucker Rods.
Pumps with capacities and characteristics to contend with every production problem known to the industry.
DEEPWELL PLUNGER PUMPS Rod Liner Type Traveling Barrel
SURE-SEAL Traveling Barrel
TRIAX PUMPS Traveling Barrel
TWO ZONE Pumps

118-G

J&L STEEL

Jones & Laughlin STEEL CORPORATION

SUPPLY DIVISION — TULSA, OKLAHOMA

Serving The United States and Canada

WORLD PETROLEUM CONGRESS

ROMA

JUNE 6-15, 1955

WHEN IN ROME

you are cordially invited to view the new full-color motion picture

"THE ORTHOFLOW FLUID CATALYTIC CRACKER"

in the

MIRROR ROOM, HOTEL EXCELSIOR

The narration will be in French and English, the official languages of the Congress. For your convenience, there will be several showings daily. There will also be a photographic exhibit of the world's newest refinery construction.

DURANT VOTRE SEJOUR A ROME

vous êtes cordialement invité à la présentation du nouveau film en couleurs

"THE ORTHOFLOW FLUID CATALYTIC CRACKER"

dans la

SALLE DES MIROIRS, HOTEL EXCELSIOR

Un commentaire sera fait en francais et en anglais, les deux langues officielles de l'Assemblée. Pour plus de commodité, plusieurs séances par jour seront organisées à votre intention. Vous pourrez en outre visiter une exposition de photographies montrant certains des types d'installation les plus récents parmi les raffineries de pétrole internationales.

AL ESTAR EN ROMA

se le invita cordialmente a la exhibición de la nueva película cinematográfica en colores

"THE ORTHOFLOW FLUID CATALYTIC CRACKER"

en el

SALON DE LOS ESPEJOS DEL HOTEL EXCELSIOR

La narración de la película se hará en inglés y francés—idiomas oficiales del Congress—y para mayor comodidad de usted se efecturán varias proyecciones al día. También se exhibirán fotografías de varias de las más modernas refinerías del mundo.

DURANTE IL VS/ SOGGIORNO A ROMA

siete cordialmente invitati ad assistere alla presentazione della nuova pellicola a colori

"THE ORTHOFLOW FLUID CATALYTIC CRACKER"

nella

SALA DEGLI SPECCHI DELL'HOTEL EXCELSIOR

Il parlato sarà in Francese e in Inglese, le lingue ufficiali del Congresso. Per Vs/ convenienza Vi saranno diversi spettacoli giornalieri. Vi sarà inoltre una mostra fotografica delle più recenti costruzioni di reffinerie nel mondo.

M KELLOGG W

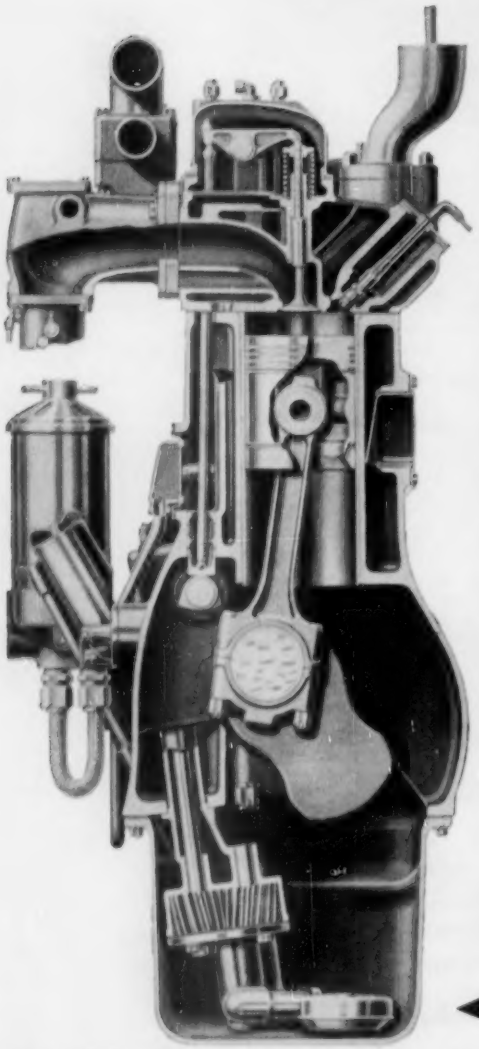
THE M. W. KELLOGG COMPANY, NEW YORK 7, N. Y.
KELLOGG INTERNATIONAL CORPORATION, LONDON, W. I.
KELLOGG PAN AMERICAN CORPORATION, NEW YORK 7, N. Y.
THE CANADIAN KELLOGG COMPANY LIMITED, TORONTO 5

Subsidiaries of Pullman Incorporated

For film showings later, address The M. W. Kellogg Company, New York 7, N. Y. or Kellogg International Corporation, London, W. I.

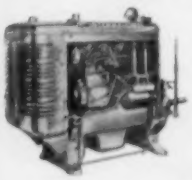
12 Solutions to Your Pumping Problems

Insist on INTERNATIONAL as original equipment on your pumps; they're tops for power as replacements, too!



An example of the sturdy construction of INTERNATIONAL *oil field engines is seen in the cutaway front sectional view of the new U-1091.*

INTERNATIONAL 4-CYLINDER OIL FIELD ENGINES

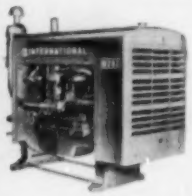


INTERNATIONAL U-264 engine is next to the largest in the 4-cylinder line with 264 cu. in. displacement and 29-52 horsepower range on the pumps.

SPECIFICATIONS

	DISP.	MAX. TORQUE @ RPM	RPM. SPEED RANGE	HP RANGE
U-1	59.5	38@1700	1500-2500	8 to 16
U-2A	113	82@1200	1200-1800	15 to 24
U-164	164	124@1000	1000-1800	18 to 36
U-264	264	197@ 900	900-1600	29 to 52
U-9	334.5	229@ 950	900-1500	31 to 55

INTERNATIONAL 6-CYLINDER OIL FIELD ENGINES



INTERNATIONAL U-282 is one of seven new IH 6-cylinder oil field engines that have shown pumpers everywhere how to cut maintenance and operating costs.

SPECIFICATIONS

	DISP.	MAX. TORQUE @ RPM	RPM. SPEED RANGE	HP RANGE
U-220	220.5	151@1200	1200-2400	30-62
U-240	240	166@1200	1200-2400	34-64
U-282	282.5	204@1225	1200-2400	41-75
U-372	372	263@1200	1200-2200	54-91
U-406	405.9	279@1200	1200-2200	56-98
U-450	450	324@1200	1200-2200	66-110
U-1091	1091.6	823@ 800	900-1600	136-200

HERE ARE SOME of the many outstanding features of this INTERNATIONAL U-1091 natural gas engine: seven-bearing counterbalanced crankshaft, torsional vibration damper, aluminum-alloy pistons, tin-plated for scuff resistance, replaceable cylinder sleeves, intake and exhaust manifolds on opposite sides for free flow of air and gas into engine and unrestricted outflow of exhaust gases, stellite inserts on exhaust valve seats, and full-pressure lubrication.

The growing tendency to standardize on stand-out performers is adding to the reputation of INTERNATIONAL pumping engines throughout the oil fields.

The INTERNATIONAL line includes 12 models of 4-and-6-cylinder oil field engines, ranging from 38.5 to 823 lbs. ft. maximum torque—from 8 to 200 net horsepower.

If you need a full measure of honest power, IH is the line for the most exacting applications. Whether you need original equipment or replacement power, check with your INTERNATIONAL Industrial Power Unit Distributor or Dealer and discover how INTERNATIONALS can do your work better and for less money.

INTERNATIONAL INDUSTRIAL POWER

MAKES EVERY LOAD A PAYLOAD

INTERNATIONAL HARVESTER

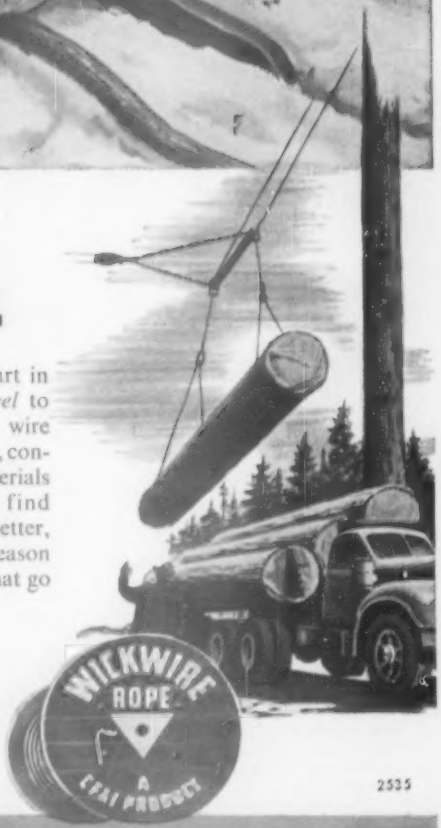
INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

now—the logs are lighter with MUSCLES OF STEEL

Gone are the days when muscles of man and beast were the only means of loading and hauling big timber out of the woods. Supplying present-day lumber needs is a job that would lick ten thousand Samsons.

It's a job that demands *muscles of steel*—rugged wire rope that lifts and pulls the heaviest logs with strength to spare.

We of Wickwire play a big part in furnishing these *muscles of steel* to American industry. Wherever wire rope is used—timbering, drilling, construction, mining, fishing, materials handling—there also you'll find Wickwire Rope helping to do a better, more efficient job. That's the reason for the quality and extra care that go into its making.



every industry benefits from wire rope

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2535

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Yuma
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Enderton (Pa.) • New Orleans • New York • Philadelphia

JOHNSON SEA-HORSE LOST IN 10 FEET OF SALT WATER FOR EIGHT MONTHS... RUNS PERFECTLY!

JOHNSON SEA-HORSE 5½ 5½ H. P.

Salvage operators, Joseph Wellman and Ralph Biddle, of St. Petersburg, Florida, tell an amazing story about the Johnson Sea-Horse they use in their salvage work. It lay on the bottom of Tampa Bay for 8 months—so covered with barnacles and sea growth it was virtually unrecognizable.

After the men recovered the motor, the owner didn't want it, thinking it was damaged by corrosion beyond repair. So, Biddle and Wellman cleaned it, replaced the electrical parts at a small cost, and put it to work.

That was 4 years ago. *The Sea-Horse has been running sweetly ever since—and doing the job better than any other motor tried!*

"We need a motor that runs smoothly, and keeps running, at extremely slow speeds. We have been able to achieve this type of performance only from your Johnson," states Joseph Wellman.

Johnson Sea-Horses are DEPENDABLE. Ask any commercial boat owner. Better yet, see your Johnson Dealer. Look for his name under "Outboard Motors" in your classified telephone directory.

All 1955 Sea-Horses are QUIET

SEA-HORSE 25 Electric Starting	25 hp	$525.00*
SEA-HORSE 25	25 hp	430.00*
SEA-HORSE 10	10 hp	310.00*
SEA-HORSE 5½	5½ hp	210.00*
SEA-HORSE 3	3 hp	145.00

* *Includes Mile-Master Fuel System.*

Prices f.o.b. factory, subject to change. All ratings are OBC certified brake hp. at 4000 rpm.

FREE! Send for catalog on the 5 great 1955 Sea-Horses—from 3 hp. to 25 hp. There's a correct model for every outboard need. Write to . . .

JOHNSON MOTORS, 6600 Pershing Road, Waukegan, Illinois

A DIVISION OF OUTBOARD, MARINE & MANUFACTURING COMPANY

In Canada: Manufactured by Johnson Motors, Peterborough

Johnson SEA-HORSE OUTBOARD MOTORS

ALL SEA-HORSES HAVE INTERNAL SALT WATER PROTECTION. NO FLUSHING NECESSARY!

mathieson

SULPHURIC ACID

Available in all principal commercial grades:

60° Bé. 77.67% H_2SO_4
66° Bé. 93.19% H_2SO_4
98% H_2SO_4
99% H_2SO_4
100% H_2SO_4
Oleum 20%-104.5% H_2SO_4

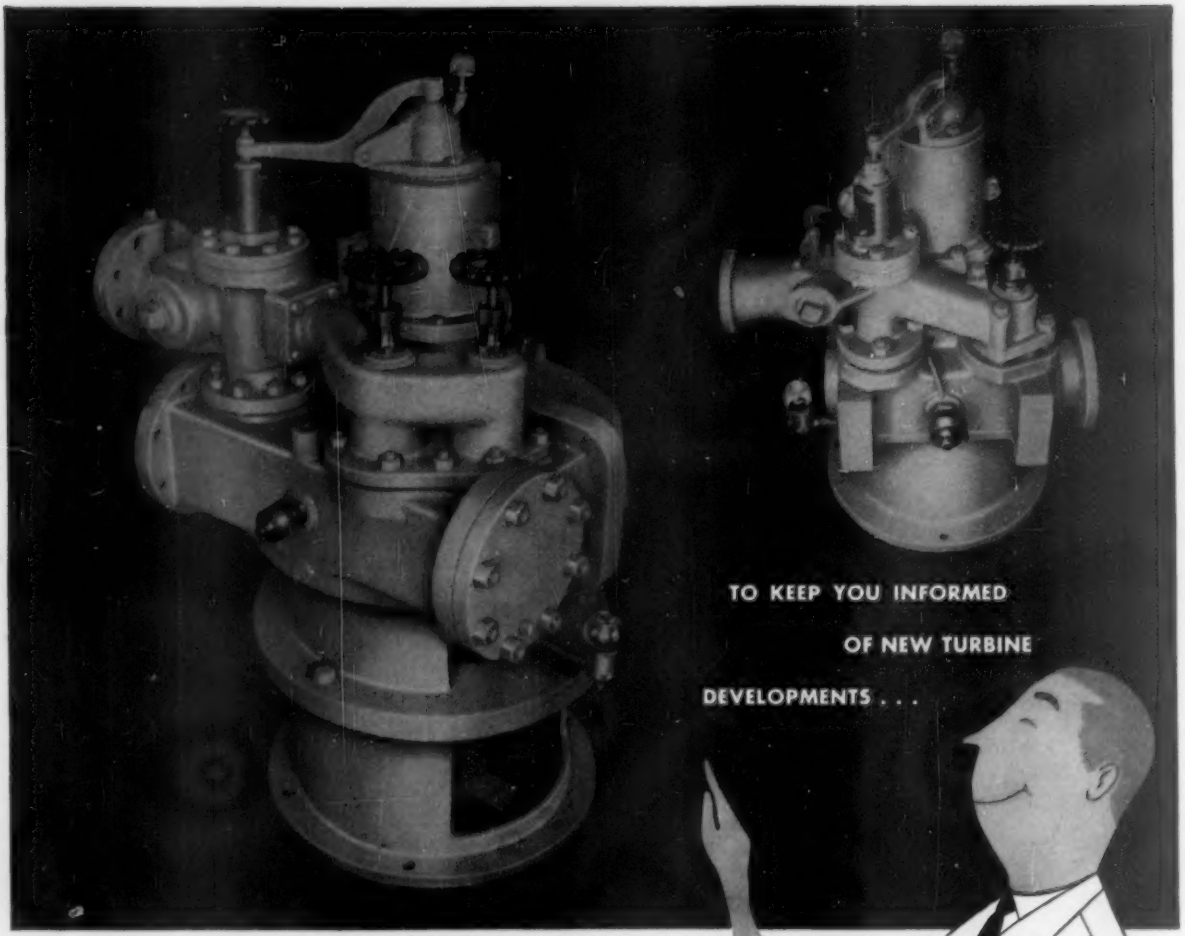
Shipments in tank trucks, tank transports and tank barges from Baltimore, Md., and in tank cars from Baltimore; Little Rock, Ark.; Bossier City, La.; and Beaumont, Port Arthur and Pasadena, Texas.

WASTE ACID

As a service to users of Mathieson sulphuric acid, arrangements can be made for the return of spent or waste acid. See your Olin Mathieson representative or write for information.

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

2887



Here are a few of the many improved features which help make the new Dean Hill Vertical Turbines your best power-package buy:

1. **MORE POWER**—An added steam nozzle for Models DH-10V (new in vertical line) and DH-20V increased power *100%* over former one-nozzle counterparts. The DH-30V now has three steam nozzles and 50% more power.
2. **BETTER PERFORMANCE**—Two hand valves improve regulation of steam rate at reduced load. Improved packing boxes check steam pressure leakage and permit higher back pressures.
3. **LONGER SERVICE**—*Double-row* ball bearing has greater thrust capacity. Overlapping labyrinth slinger on lower bearing prevents moisture seepage.
4. **POSITIVE SAFETY**—Improved emergency trip mechanism has cylindrical guide to maintain alignment of trip valve stem in all positions.

MORE DETAILS?

You will want to study the other improvements in the DH Line . . . improvements made to increase the useful life and efficiency of the turbine without sacrificing the compactness and simplicity of design. Write now for our new Catalog No. 500, which includes full details on both Vertical and Horizontal DH Turbines.

DEAN HILL PUMP COMPANY

Pump and Turbine Engineers Since 1893

Indianapolis 7, Indiana

Sales Offices In: Chicago, New York, San Francisco, Boston, Cincinnati, Denver, Albuquerque, El Paso, Salt Lake City, New Orleans, Philadelphia, Tulsa, Los Angeles, Pittsburgh, Houston, Dallas, St. Paul, Toledo, Cleveland, Grand Rapids, Birmingham, Ala., Louisville, Memphis, Richmond, Mexico City, Montreal, Reading, Pa., The Hague, Washington, Charlotte, Casper, Wyo., Knoxville.

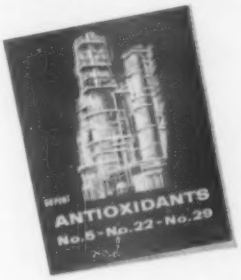
DU PONT
REG. U.S. PAT. OFF.

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT
REG. U.S. PAT. OFF.

May ★ One of a Series of Interest to the Petroleum Industry ★ 1955

NEW ANTIOXIDANT BOOK NOW AVAILABLE



The complete line of Du Pont Antioxidants – Nos. 5, 22 and 29 – is fully discussed in a new 32-page book.

In addition to the regular application of these antioxidants in motor and aviation fuels, the new book covers the antioxidant sweetening process. It also discusses fully the properties and methods of addition of Du Pont Antioxidants. And there are informative chapters on the general history and function of antioxidants.

The book is profusely illustrated with drawings, colored charts and detailed diagrams. If you would like a copy, just write or mention it to any of our Petroleum Chemicals Division representatives or regional offices.

Refiners can now reduce gasoline treating costs

You can now save about 6% on the cost of Du Pont Gasoline Antioxidant No. 22 . . . by purchasing in tank car lots. In these days of shrinking profit margins, this cost reduction can be an important advantage to you.

Special Cars

To make it convenient for you to take advantage of this saving, Du Pont has available special tank cars with a capacity of 4,000 gallons, or approximately 31,000 pounds of antioxidant. They are equipped with steam coils to facilitate unloading.

Additional Help

Also, the Operations Group of the Du Pont Petroleum Chemicals Division will be glad to help you work out any individual unloading or storage problems which tank car shipments might entail. And any of our representatives or regional offices will be glad to give you further information on these tank car shipments.

A DU PONT SALES SERVICE

To help you take advantage of new lube oil promotion opportunities

Never before have you been able to offer a motor oil with an effective low-duty detergent. But there are now two new polymeric additives that make this possible – Du Pont Lube Oil Additives 564 and 565. And with such an outstanding advantage, they also offer you unique promotion opportunities.

To help you make the most of these opportunities, the Du Pont Petroleum Chemicals Division has prepared a special advertising and promotion kit.

YOU CAN BUILD a complete lube oil promotion plan around the wide variety of suggested copy ideas and other aids contained in this kit.

This kit is stuffed with useful aids and suggestions for promoting your brand of lube oils containing one of these new Du Pont additives. It includes *suggested* copy and layout for newspaper ads, descriptive folders, and a 24-sheet highway poster and window sticker.

Provocative Ads

One of the newspaper ads is designed to focus the attention of the average motorist on the fact that he actually gives his engine harder wear than the typical long distance trucker. The copy then points out that your brand of motor oil contains a special additive with a detergent action to retard the formation of engine sludge and varnish caused by average stop-and-start driving conditions.

Another suggested ad is built around the common problem of water dilution in the crankcase. It clearly explains how low-duty driving in traffic accentuates this problem . . . and how the polymeric Du Pont additives prevent harmful sludge from forming—even in the presence of water.

To meet your individual promotion requirements, the ads can be readily reduced or increased in size. And the suggested 24-sheet highway poster

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Lube Oil Promotion*

can be adapted in size to become a window sticker or station banner.

The copy for these ads and booklets, however, should be rewritten and individually slanted to incorporate the regular competitive features of your own brand of motor oil.

Other Helps

The kit also includes a 12-page technical book and background articles on the development and special properties of these new polymeric lube oil additives. These can be especially helpful to you in tailoring your own promotion material for introducing a new product containing one of these additives.

In addition, there are suggested sales talks to acquaint and excite your dealers with the outstanding advantages of your new product.

SUGGESTIONS for folders, envelope stuffers, a 24-sheet highway poster, window sticker and banner are included on this typical page from the kit.

If you are now using, or are planning on using one of these new Du Pont additives in your lube oils, you will certainly want to take advantage of the special helps contained in this promotion kit. For full details, get in touch with any Du Pont Petroleum Chemicals Division representative or regional office.

DETROIT DISTRICT MANAGER

PAUL H. RICHARD has been named manager of the newly-formed Detroit District of the Du Pont Petroleum Chemicals Division. This district comprises the major portion of the state of Michigan.

An automotive specialist, Mr. Richard will work closely with the automotive industry on combustion and lubrication problems in addition to oil company sales-service contacts.

Joining the Du Pont Company in 1949, he was first assigned to engine research work on fuel scavenging agents. From 1943 to 1947 he was with the National Advisory Committee for Aeronautics, where he worked on fuel evaluation, cooling, compound power plants and turbo-jet fuel systems. Later, with the Lima-Hamilton Corporation, he worked on locomotive diesel engines and free-piston gas turbine power plants.

Mr. Richard was graduated from Pennsylvania State College with a B.S. degree in mechanical engineering. He is a member of the Society of Automotive Engineers.

New slide presentation to help your dealers sell themselves

An animated talking cash register acts as master of ceremonies for this unusual slide presentation. As it speaks, color slides are projected onto a screen beside it.

Prepared by Du Pont, this 20-minute educational program is designed for use by oil industry marketing groups in their regularly scheduled meetings with dealers and salesmen. The title is "SELL YOURSELF."

The sales value of improving human relations with customers is the central theme of the presentation. The slides and accompanying script encourage service station attendants to capitalize on the selling power of personal neatness, pleasant, friendly conversation and common courtesy. The fact that women motorists are important, valued customers is also pointed out.

The whole program is wrapped around an interesting plot. The central characters are Joe Wright, an on-the-ball service station operator, and Joe Wrong, a sloppy, unfriendly type of operator. The presentation demonstrates why Joe Wrong's approach is unsuccessful—while on the other hand, Joe Wright's personal selling keeps his cash register ringing.

If you would like to supplement your own dealer training program with one of these "Sell Yourself" presentations, any of our regional offices will be glad to give you full information on obtaining it.

DU PONT
Better Things for Better Living
. . . *through Chemistry*

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

Regional Offices:
NEW YORK, N. Y.—1270 Ave. of the Americas Phone COlumbus 5-2342
CHICAGO, ILL.—8 So. Michigan Ave. Phone RAndolph 6-8630
TULSA, OKLA.—P.O. Box 730 Phone Tulsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. Phone BLackstone 1151
LOS ANGELES, CALIF.—612 So. Flower St. Phone MAdison 5-1691

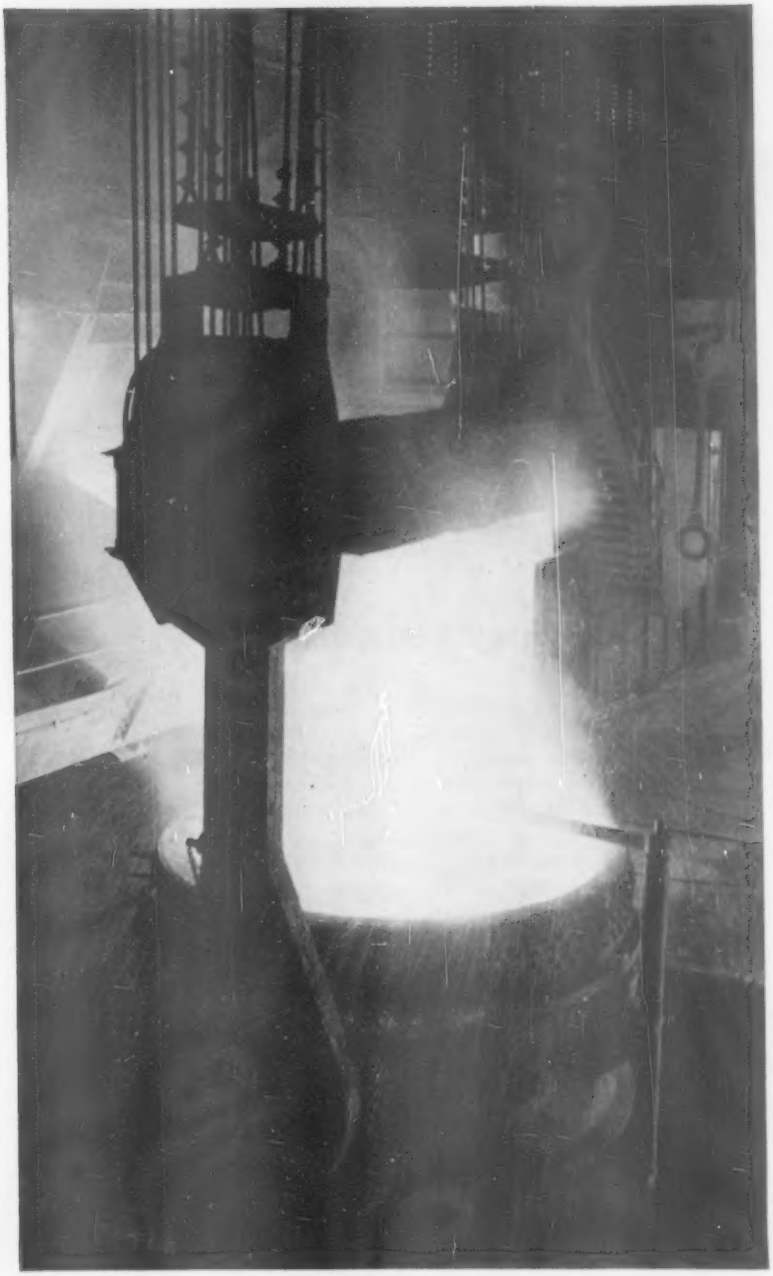
IN CANADA: Du Pont Company of Canada Limited—Petroleum Chemicals Division, 80 Richmond Street, West, Toronto 1, Ontario
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Bldg., 6539—Wilmington 98, Del.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-9141

Printed in U. S. A.

Our own nickel-rich alloy steel, made in our own plant, makes TIMKEN® bearings tougher



NICKEL makes steel tougher. So, our steel-making specialists don't skimp on nickel in the fine alloy steel we make for Timken® tapered roller bearings. They use exactly the right amount of nickel to give these bearings the toughness they need to withstand shock and last longer. Exacting quantities of chromium or molybdenum or both guarantee uniform hardness. By using the steel industry's first direct-reading spectrometer, we exercise hairline control of each element at the precise instant of tapping the furnace.

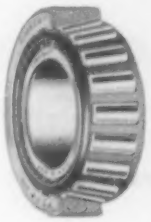
Rolling, annealing, and cooling are done with the same meticulous care. And every race and roller that goes into a Timken bearing is precision case-carburized to give it a hard, wear-resistant surface over a tough, shock-resistant core.

We've been specializing in the production of fine alloy steel for almost forty years. We're the only bearing manufacturer in the country that makes its own steel, because it's the only way we can make sure the quality of our bearing steel is just the way we want it. Steel is the heart of the bearing. That's why we insist on controlling bearing quality *every* step of the way—from melt shop to final bearing inspection. And that's why we don't skimp on the use of nickel.

To be absolutely sure of the highest performance standards in the equipment you build or buy, always specify Timken tapered roller bearings. They are made from seamless tubing or forgings by the most modern processes, under strict control. Only Timken bearings roll so true, have such quality thru-and-thru. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

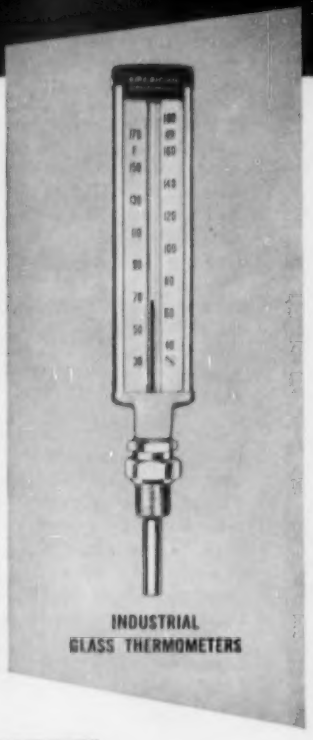
Only **TIMKEN**® bearings roll so true, have such quality thru-and-thru



DIAL THERMOMETERS

RECORDING THERMOMETERS

GET SERVICE-PROVED ECONOMY



INDUSTRIAL GLASS THERMOMETERS

SPECIFY

AMERICAN THERMOMETERS!

Is exact temperature measurement essential to safeguard your equipment? To assure uninterrupted service to customers? To maintain product quality? To control costs? Then American Thermometers belong in your plant! They are an unbeatable combination of highest quality materials, advanced design, rugged construction and precision manufacture. Their sustained accuracy protects processes, products and profits. Their long-life durability has been proved in outstanding performance in the severest services.

Whether you need industrial glass thermometers, dial types, or recorders, the complete American line provides for practically every application. Depending on instrument type and requirements, temperature ranges available are: minus 80° F. to plus 1150° F. Types of actuation include: mercury, vapor pressure, gas and bi-metal.

FOR EXPERIENCED COUNSEL, prompt delivery from local stocks, and greatest economy, buy through your Industrial Supply Distributor. Catalog sent on request.

1850 AMERICAN U S A

AMERICAN INDUSTRIAL INSTRUMENTS

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

MAKERS OF 'ASHCROFT' GAUGES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, *Stratford, Conn.* HANCOCK VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Oklahoma.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

MOTORISTS KNOW NOTHING ABOUT THESE ADDITIVES BUT THEY'D MISS 'EM IF GASOLINE DIDN'T HAVE THEM

Tenamene

EASTMAN GASOLINE ADDITIVES

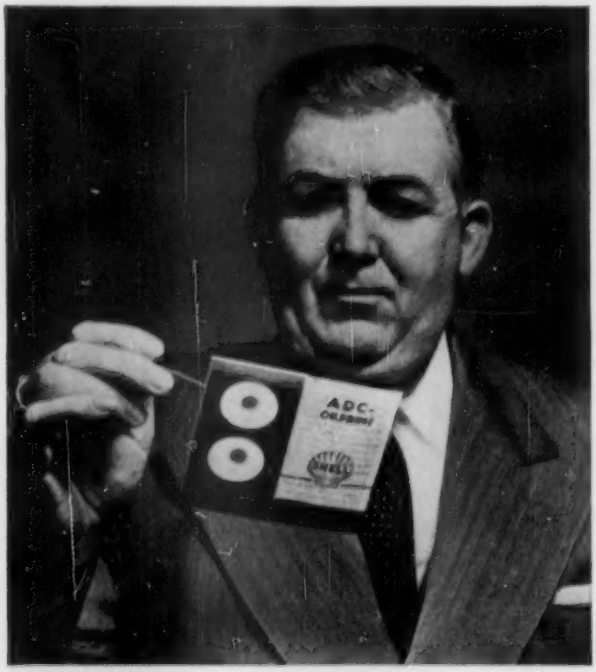
Behind the performance of gasoline, the protection of the gum-inhibiting Tenamenes. Behind the Tenamenes, the interested technical service of Eastman—men and company—ready at short notice to solve refinery inhibitor problems on the spot.

SALES OFFICES: **Eastman Chemical Products, Inc.,** Kingsport, Tennessee; New York—260 Madison Ave.; Framingham, Mass.—65 Concord St.; Cincinnati—Carew Tower; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **West Coast: Wilson Meyer Co.,** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave.; Salt Lake City—73 S. Main St.; Seattle—821 Second Ave.

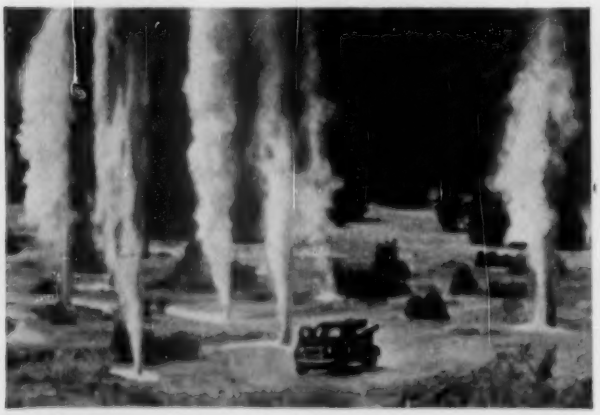
For more information on Tenamene additives and the service that backs up their proper use, contact our local representative or write to Eastman Chemical Products, Inc., Kingsport, Tennessee—a subsidiary of Eastman Kodak Company.

What's New at SHELL

A PICTURE ROUND-UP OF SOME ACTIVITIES THAT MADE NEWS OUTSIDE THE PETROLEUM WORLD.



FLEET WORK. In minutes, this Shell-trained oil detective can now diagnose truck engine ills such as faulty oil filters, thermostats and cooling systems—in time to avoid costly damage and major repair bills. Shell's ADC Oilprint analysis, announced for big fleet operators recently, is another example of far-thinking Shell research.



GROUND ATTACK. West of San Antonio, a Shell exploration crew uses the new technique of "pattern shooting" in search for oil. Simultaneous blasts send shock waves deep into the ground, help geologists locate possible oil pockets. "Pattern shooting" is one of the look-ahead techniques constantly employed by Shell crews. These techniques helped Shell bring in many new fields last year.

BUG HATERS. The "most economical, most effective bug-fighters yet devised," says Coronet magazine of aldrin and dieldrin, developed by Shell Chemical Corporation. Tested world-wide over a six-year period, these lethal pesticides will destroy whole armies of man's insect enemies, including sub-surface root grubs which impede the growth of cornstalk, *above, left*. Shell's big investment in research is a solid investment in the future for all of us.

SHELL

AVAILABLE JOHNSTON by AL CAPP

STOP!!
IT'S CROOL T' STUFF THAT CRITTER IN A HOLE!!
WE HEARS CATS' WHISKERS MEASURES OIL-WELL INSIDES!!-
Al Capp
NO!!- YOU HEARD THE JOHNSTON HYDRAULIC HOLE CALIPER IS THE CAT'S WHISKERS, FOR CHARTING BORE-HOLE DIAMETERS!!
IT LOGS SUB-SURFACE FORMATIONS, TO GIVE AN ACCURATE PROFILE-
SPEAKIN' O' PROFILES, YO' JOHNSTON BOYS GOT MIGHTY HAN'SOME ONES!!-
SORRY!!- WE GOTTA LOG A WELL, WIF THAT CALIPER THAT SAVES RIG-TIME!!

C-5411

Copr. Capp Enterprises 1954

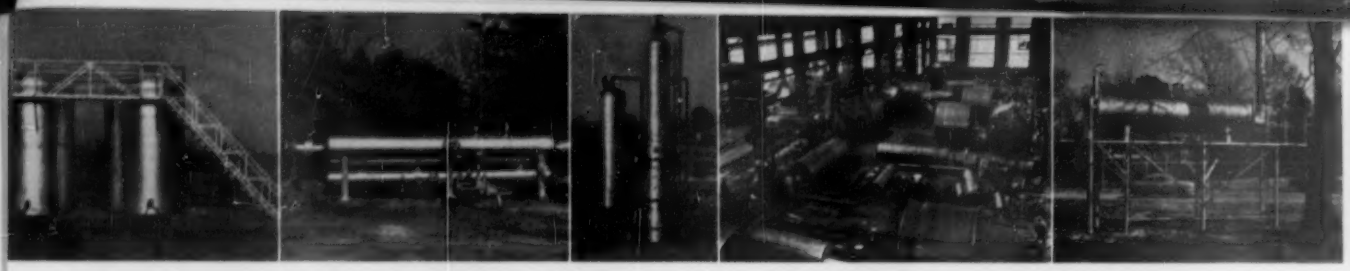
JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

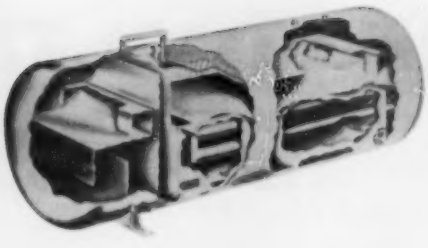
LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON



first
anniversary

DUNHAM



"A Once in a Life Time Story"
Ask any Dunham Tank Customer what tank company is . . .

1st. in tanks? You'll probably hear about the skillful design and efficiency of Dunham's superior operating equipment. How Dunham has the industry's best qualified engineers. How their modern machinery and equipment have improved the standards of tanks and related products

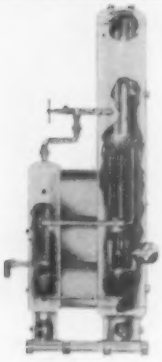
1st. in economy? Hear about the terrific savings you earn on initial and over-all costs.

1st. in service? Find out about the kind of hustle and ambition you always dream about but seldom see. Find out how well Dunham is competing because of this important factor. Learn about their competence and sensibility.

1st. in growth? After finding out about Dunham's tanks, service and growth, you will easily see why Dunham sales and service offices have spread across the oil patch from Natchez, Mississippi to Odessa, Texas. If there is no office in your territory, look for one soon.

TANKS

Dunham Tanks is the world's fastest growing tank company.
Thanks to our customers who have helped us start.



ANDERSON-DUNHAM, INC.
DUNHAM TANKS
TANK DIVISION

Here it is! THE ALCO STANDARDIZED DIESEL-ELECTRIC DRILLING RIG POWER PLANT

The First Standard-Package Power Plant to Give You Smooth, Push-Button Operation Under All Conditions on Land or Sea!

With this new Alco Standard-Package Power Plant you can handle practically any drilling condition easily and efficiently at a cost *competitive with an ordinary power rig.*

Flexibility is the keynote of its economy. You can use it on land and off-shore for all normal power requirements. You can choose diesel engines ranging in size from 550 to 2400 hp for drilling depths of 5000 to 15,000 feet.

Drawworks, mud pumps, rotary tables can be powered singly or in combination. Changing requirements can be met by making simple adaptions with corresponding adjustments on the control panel. Design is remarkably simple. Standard replacement parts are easily obtainable. And all units can be moved economically from site to site.

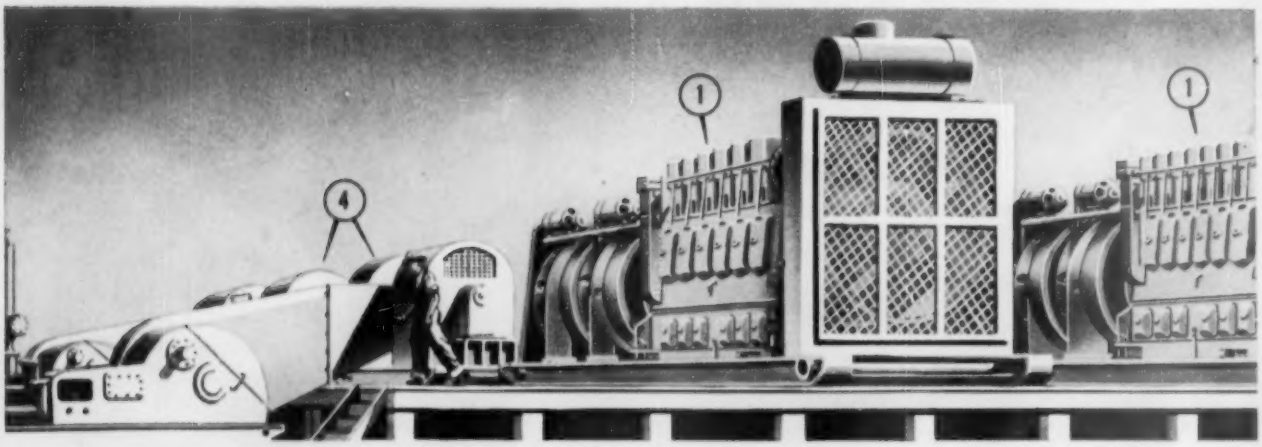
Write today for Alco Drilling Rig Power Plant Bulletin —Alco Products, Box 1065, Schenectady 1, New York.

ALCO PRODUCTS

AMERICAN LOCOMOTIVE COMPANY

Consult your ALCO Sales and Engineering Representative at:

ATLANTA, Ga.	490 Glenn Street, S. W.
BEAUMONT, Tex.	1406 Crockett Street
CHICAGO, Ill.	909 McCormick Building
CLEVELAND, Ohio	Terminal Tower Building
HOUSTON, Tex.	1404 Dunlavy Street
KANSAS CITY, Mo.	606 Commerce Trust Bldg.
LOS ANGELES, Calif.	2500 West 6th Street
NEW YORK, N.Y.	30 Church Street
PITTSBURGH, Pa.	527 Frick Building
ST. LOUIS, Mo.	4050 Bingham Avenue
ST. PAUL, Minn.	625 Prior Ave. N.
SAN FRANCISCO, Calif.	235 Montgomery Street
TULSA, Okla.	200-206 North Denver Street
WASHINGTON, D.C.	910 17th Street, N.W.



Take a good look at all the specific advantages this ALCO Standardized Diesel-Electric power plant gives you

Standardized Units—No expensive engineering development costs. Immediately available standard replacement parts for the years ahead.

Portability—All components on skids. Individual weights reduced to minimum. Ruggedly built to withstand moves from site to site.

Simplified Design—Each component engineered to fit into the "package." Other components included as required through simple additions to control panels. Built-in accessibility to every unit for easy servicing and maintenance.

Simplified Control—Easier to operate than a steam rig, with driller controlling entire operation from "push-button" control stand.

Engineering Service—Readily available engineering assistance in planning applications of the standard package, and any adaptations necessary now or in the future. Service engineers permanently stationed in the Southwest and elsewhere at your call for field service and maintenance inspection. Genuine Alco Renewal Parts are available from district sales offices and warehouses.

Faster Drilling—Instant responsiveness of smooth electric power—plus flexibility of control—speed drilling, mean less down time.

Lower Drilling Costs—Cost per well lowered with time at site reduced. Maintenance costs cut not only on power plant, but on rig equipment as a whole because of smoother operation. Units can be adapted for dual fuel use, too.

THE "STANDARD-PACKAGE" ALCO DRILLING POWER PLANT

1. Two Diesel-Engine Generator Sets, each consisting of a diesel engine, two main generators and an auxiliary generator.
2. Main Control Panel
3. Two Drawworks Motors
4. Two Mud Pump Motors
5. Driller's Control Stand
6. Driller's Control Cabinet

COST—Competitive with that of an Ordinary Power Rig

From a Jenny TO A JET

FROM OBSOLETE METHODS TO MODERN JET PERFORATING

No one derided old bi-plane crates when they were the best available, but they disappeared when better planes were developed. Most operators today are convinced of the superiority of modern jet perforating over older methods . . . have switched over because they get more positive perforating . . . deeper penetrations from Welex Jets. To guarantee better results . . .

Cutaway View of Modern Welex Jet Perforator

Call Welex and be Sure!

ORIGINATORS OF JET PERFORATING

Welex JET SERVICES, INC.

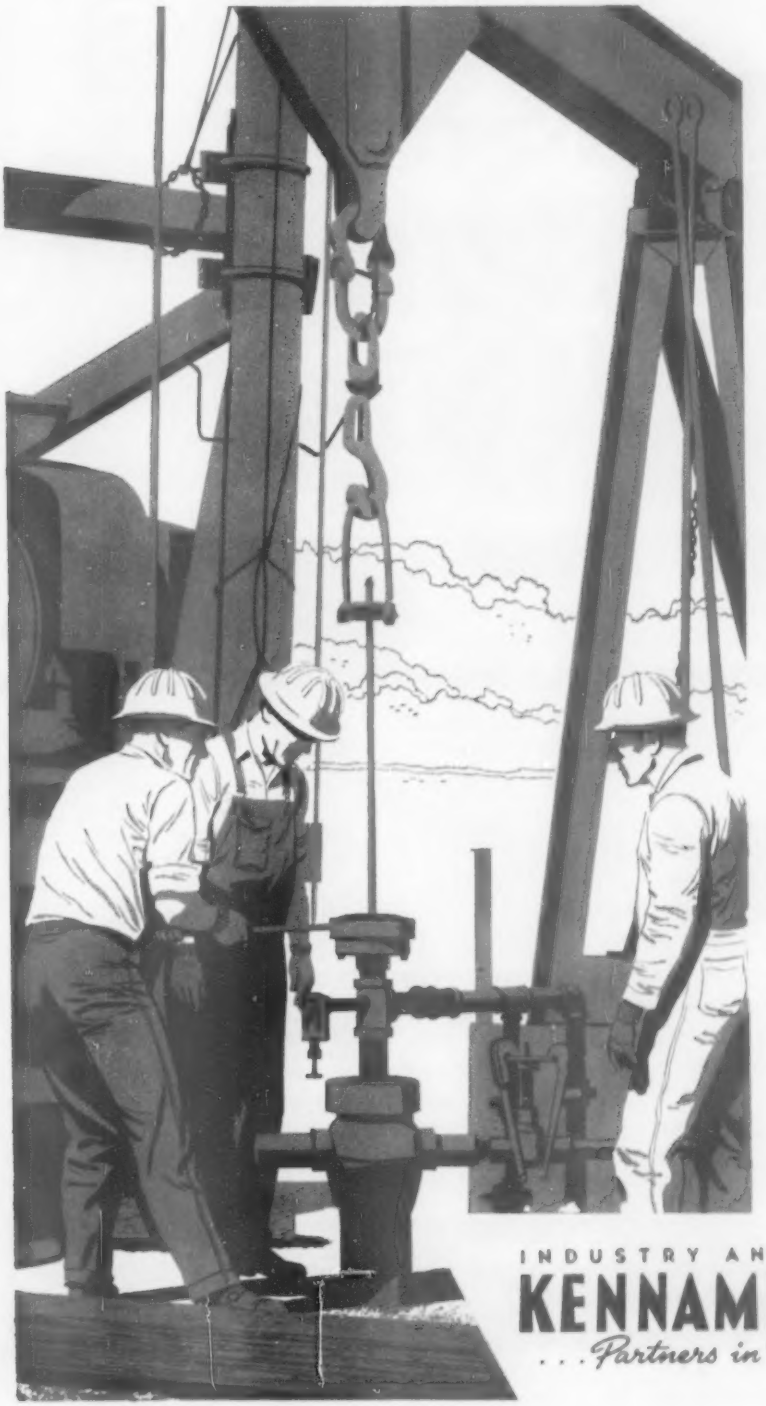
General Offices:
1400 East Berry, Fort Worth, Texas

Division Offices:
Houston • Midland • Tulsa • Oklahoma City

District Offices: Abilene • Ardmore • Bartlesville • Beaumont • Corpus Christi • Falfurrias Gainesville • Great Bend • Hobbs • Houston Lafayette • Liberal • Odessa • Pampa • Pauls Valley • San Angelo • Shawnee • Snyder Stillwater • Wichita Falls • Winfield

Kennametal* goes back down the hole **after 448 days**

...maximum life of previous valving – 20 days



This West Texas producer pumped 168 barrels of oil a day from a well 2370 feet deep. Valve failure caused by sand abrasion of the balls and seats forced him to surface the pump every 14 to 20 days of operation.

After replacing the previous valving with Kennametal Balls and Seats, he got, at last report, 448 days of service before he pulled the pump—and this was for a problem other than valve wear. At that time, the Kennametal Balls and Seats were found to be in satisfactory condition and replaced in the cages. They are still on the job after having served over 22 times as long as previous balls and seats.

Figured in terms of the costs of string pulls, pump repairs and loss of production due to frequent valve failure in problem wells, it doesn't *cost* to use Kennametal, *it pays.*

Kennametal Sintered Carbide, API Balls and Seats are available at repair shops of most major pump manufacturers. Ask your service man to standardize on them. They'll cost you less in the long run.

KENNAMETAL INC., Latrobe, Pa.

* Registered Trademark

INDUSTRY AND

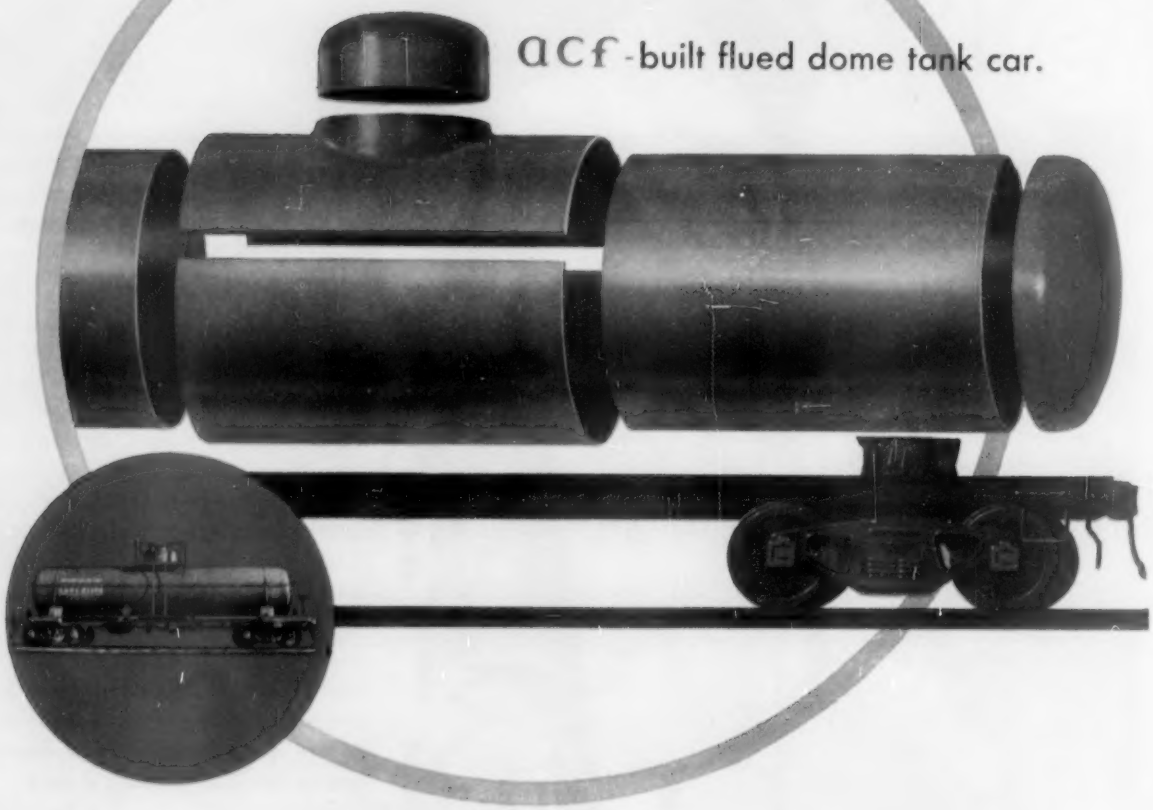
KENNAMETAL

. . . Partners in Progress

RING-SECTION CONSTRUCTION

another EXCLUSIVE feature of DURADOME

acf-built flued dome tank car.



ONLY DURADOME gives you the advantage of superior "ring-section" construction . . . formerly found only on pressure cars. This cylindrical construction means heavy steel *all* the way around – not just at the bottom – for greater durability and protection of costly ladings. Each tank is tested at pressures considerably higher than I.C.C. specifications.

Note that extra heavy gauge top center section – perfectly flued to form the dome base. This exclusive feature gives you a smooth interior for unequalled ease of cleaning . . . much better application of lining . . . unmatched structural strength and corrosion resistance.

• • •

These exclusive DURADOME features . . . *plus* the *standardized underframe* and *all-welded insulation jacket* . . . are yours at no extra cost. Contact your Shippers' representatives for details on buying or leasing the revolutionary new DURADOME.

Specialists for over 35 years in the leasing, operation, maintenance and servicing of tank car fleets – now exclusive sales agent of acf *tank cars for industry.*

SHIPPERS SHPX CAR LINE

Shippers' Car Line Corporation

A subsidiary of acf INDUSTRIES, Incorporated

30 Church Street, New York 7, N.Y.

CHICAGO, ILL. • HOUSTON, TEX. • SAN FRANCISCO, CAL. • MILTON, PA. • EAST ST. LOUIS, ILL. • SMACKOVER, ARK. • TULSA, OKLA. • NORTH KANSAS CITY, MO.

They Say—

Shale-Oil Progress

"Union's interest in shale oil dates back to 1920, when we purchased our first piece of shale property. Later acquisitions have swelled our holdings to 50 thousand acres; and our recoverable reserves are estimated conservatively at 5 billion barrels, more than eight times our reserves of petroleum. . .

"Although some shale oil is produced and refined commercially abroad, this operation has not yet been proved economically feasible in this country. . . The 1951 study of the National Petroleum Council . . . indicated that the time for commercial exploitation was very near. Last year Union undertook an independent review of this problem. . .

"We concluded that with present technology, shale oil may well be as profitable as the average investment in finding new domestic crude oil, and that shale oil will become relatively more profitable as the costs of finding crude oil increase. . .

"During the next 2 years, we will build and operate a commercial scale, 1,000-ton per day retort in Colorado, confirm and perfect the manufacturing procedure by pilot-plant studies, and develop detailed designs for a full-scale shale-oil plant. . .

"This work will provide us an accurate estimate of capital expenditure and operating costs, and will permit a dependable appraisal of the profit potentialities of this project. If this program yields the anticipated results, and if economic conditions then justify it, we will be ready to undertake full-scale commercial development. . ."

Reese H. Taylor, president, Union Oil Co. of California, in an annual statement to shareowners.

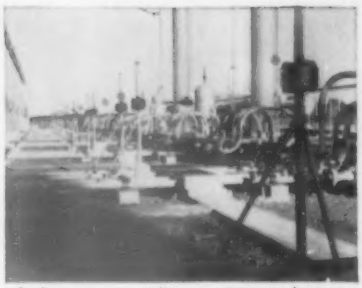
Editorial Barber

Dear Sir:

I thoroughly enjoyed reading your column, "Journally Speaking," in the March 21 issue of The Oil and Gas Journal. You certainly get the point across in your column of what a catalyst does. Perhaps I should have had you as an associate in the write-up on "Catalysis" (in the same issue).

I was a little surprised, perhaps

BS&B Safety Head used as a final relief device on a high pressure well-head. Platform and stair are BS&B Safwalk.

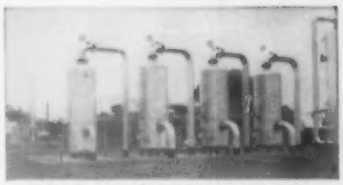


Each compressor line at this condensate recovery—pressure maintenance plant is BS&B Safety Head equipped.

BS&B Safety Heads... Sentinels of the Oilfields!

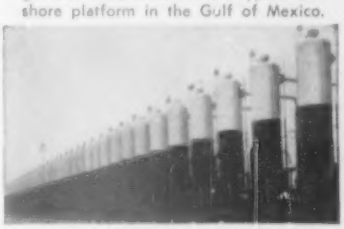
Wherever you travel in the oil industry today, you are likely to see BS&B Safety Heads performing sentinel duty over millions of dollars worth of property and equipment and countless human lives! You'll find them on oil and gas separators, emulsion treaters, gas scrubbers and heat exchanger shells . . . on storage tanks, refinery pressure vessels, in gas compressor stations and along the pipelines. They are there for one purpose only—to provide *safe, instantaneous relief* from overpressure, should it occur in the system!

If you'd like a catalog or more information about BS&B Safety Heads, contact your nearest BS&B Representative...or write to us direct.



Each of these four gas scrubbers at a southern natural gasoline plant is protected by a BS&B Safety Head.

BS&B Safety Head on high pressure gas scrubber, as seen on a typical offshore platform in the Gulf of Mexico.



In this central separator battery, each vessel has a BS&B Safety Head for protection from overpressure.

THE "CIRCUIT-BREAKER" of Pressured Systems

For Better Regulation of Pressures, Temperatures Liquid Levels or Flow, Equip Your Process With BS&B AUTOMATIC CONTROLS!

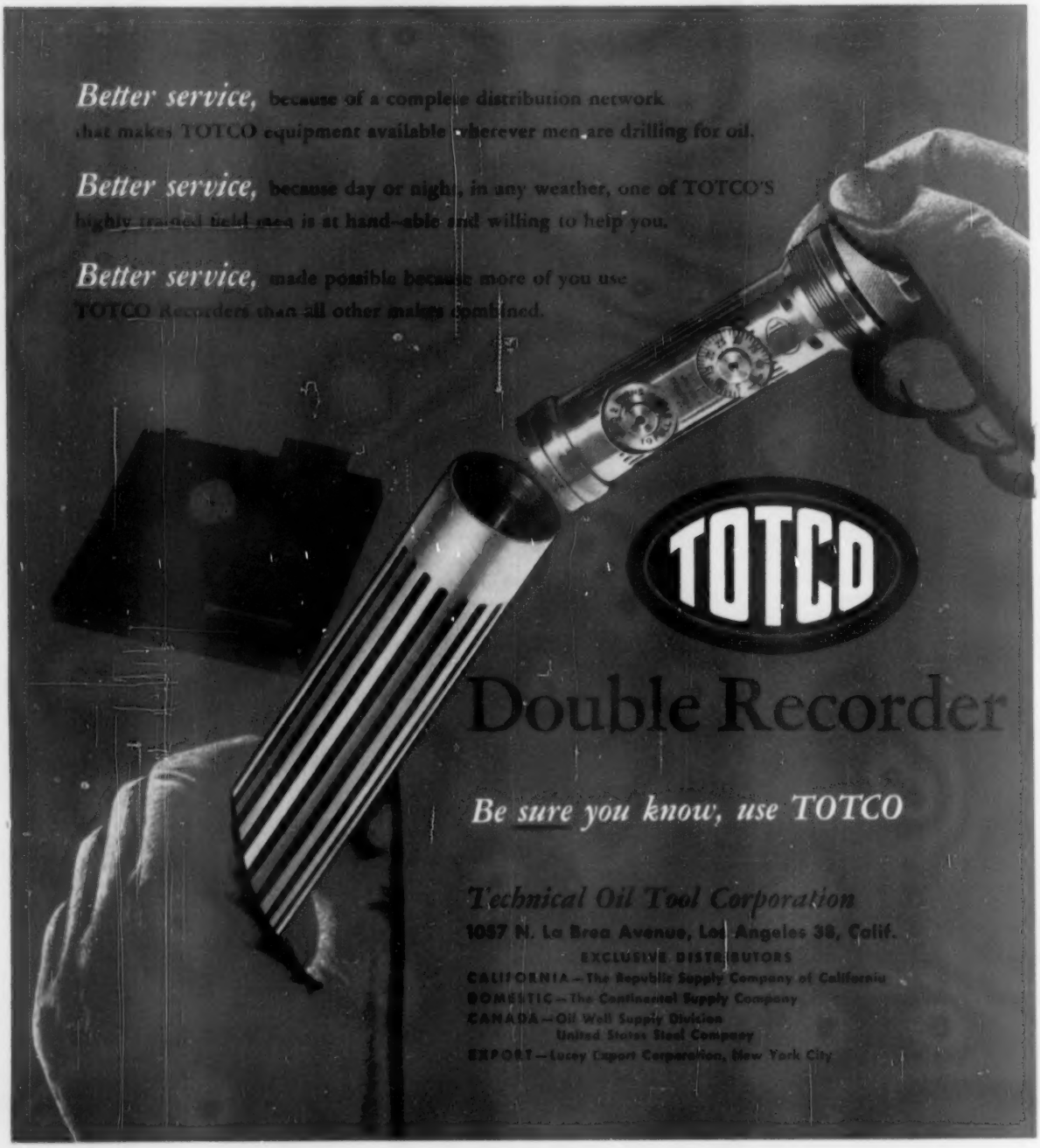
BS&B — OVER 60 YEARS — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Safety Head Division, Dept. 2-A5.
7500 East 12th Street
Kansas City 26, Missouri

From Tulsa to Teheran

TOTCO means Better Service


Better service, because of a complete distribution network that makes TOTCO equipment available wherever men are drilling for oil.
Better service, because day or night, in any weather, one of TOTCO'S highly trained field men is at hand—able and willing to help you.
Better service, made possible because more of you use TOTCO Recorders than all other makes combined.
TOTCO
Double Recorder
Be sure you know, use TOTCO
Technical Oil Tool Corporation
1057 N. La Brea Avenue, Los Angeles 38, Calif.
EXCLUSIVE DISTRIBUTORS
CALIFORNIA—The Republic Supply Company of California
DOMESTIC—The Continental Supply Company
CANADA—Oil Well Supply Division
United States Steel Company
EXPORT—Lucey Export Corporation, New York City

naively, that this article appears to be long-haired. There is certainly a difference of opinion as to what is long-haired and what isn't, but I really tried to get the article out of the long-haired class.

A. G. Oblad
Associate Manager
Research and Development Division
Houdry Process Corp.
Marcus Hook, Pa.

How to Lower Living Standard

"The use of our energy resources is the foundation of our standard of living. Natural gas furnishes 23.1 per cent of such resources in the nation and 30 per cent in California.

"Gas is a basic commodity like oil, coal, lumber, and wheat. In a free economy, it can be obtained by the consumer only by paying a price at the point of production that will stimulate people to engage in the production and adequately compensate them for their effort.

"Any policy that tends to reduce the supply of one of our important energy resources will inevitably lower our standard of living. This reduction in supply will tend to increase prices. . ."

Paul Kayser, president, El Paso Natural Gas Co., in an address before a Town Hall meeting in Los Angeles.

Conflicts With Fundamentals

"The (natural-gas) consumer would at best enjoy the dubious benefit of less gas at slightly lower prices; the producer, if such fixed prices were below true market value, would be faced with confiscation of property and complete lack of incentive for future oil and gas exploration. . .

"The whole idea of the federal Government regulating the price of a commodity at the point of production is in conflict with the fundamental American ideas on the subject of economics."

Gov. J. Hugo Aronson of Montana in a statement filed with the House committee on interstate and foreign commerce.

Texaco and Imports

"We believe that it is of the greatest importance to our nation that we have a strong domestic oil industry and a strong American-owned foreign oil industry. . . In 1954, when state regulatory bodies were reducing domestic production, The Texas Co. . . . voluntarily reduced its imports of crude oil

HENRY H. PARIS DISTRIBUTOR Inc.
Manufacturer's Agent - Oil Well and Refinery Supplies
P. O. BOX 932 HOUSTON, 1135 ROTHWELL ST. TEXAS

Agent and Distributor for the Following Nationally Known Manufacturers:

ALTEN FOUNDRY & MACHINE WORKS
Lancaster, Ohio
Pumping Units, Jacks & Surface Equipment.

THE OHIO INJECTOR COMPANY
Wadsworth, Ohio
OIC Valves, Bronze, Iron, Cast and Forged Steel for all purposes.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

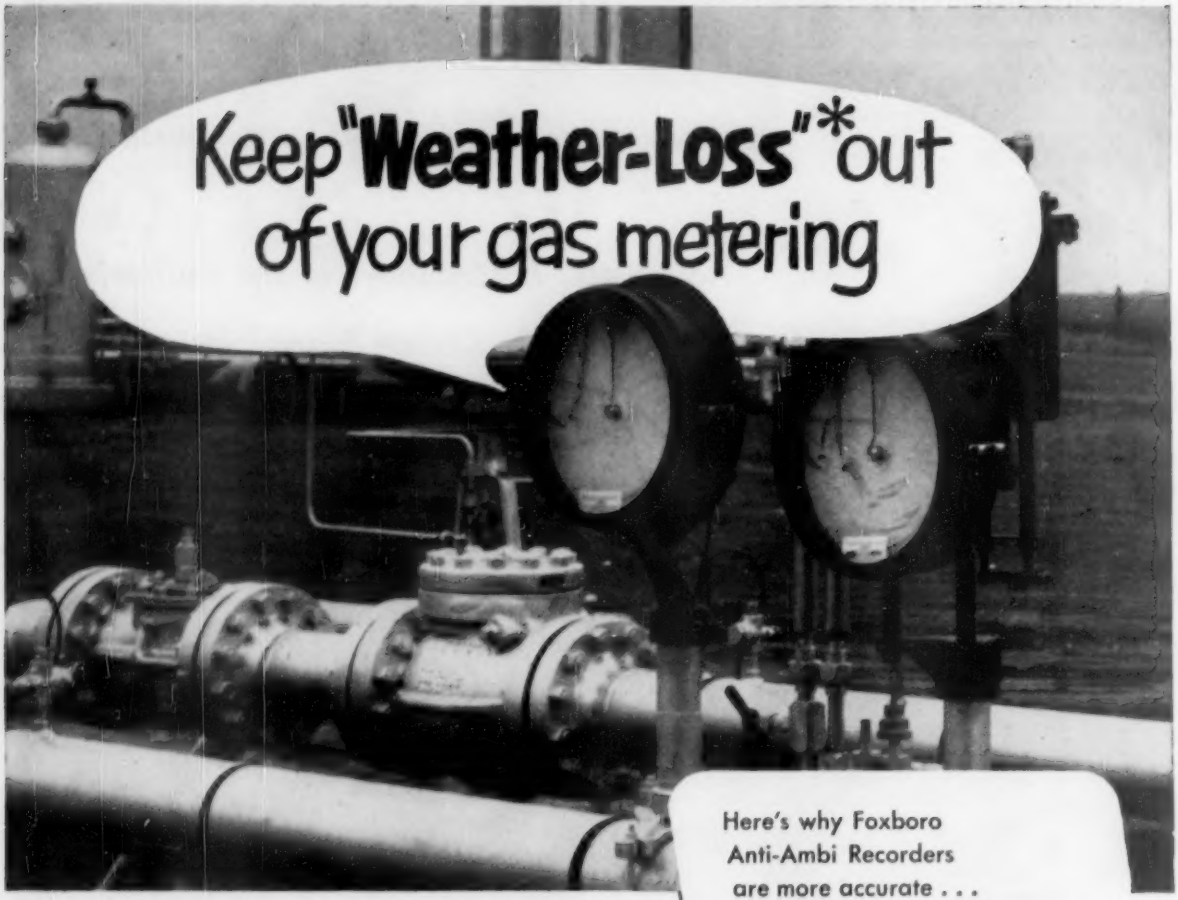
VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

LOS ANGELES BOILER WORKS
Los Angeles, California
Welding Caps—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.



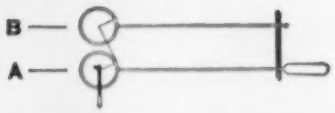
Keep "Weather-Loss"* out of your gas metering

*Weather-loss is the error in metered gas volume caused by temperature variations. Unless corrected, a variation of 10° F. in gas temperature will cause an error of 1% in metered volume. And that can mean big money losses from season to season. With Foxboro Anti-Ambi Temperature Recorders in your line you eliminate these errors . . . you can compute *actual* gas delivery, regardless of weather conditions.

Like all other Foxboro Instruments, Anti-Ambi Recorders are ruggedly built for accurate, trouble-free performance year after year. Weather-tight case allows outdoor installation. Write for complete information.

The Foxboro Company,
605 Neponset Ave.,
Foxboro, Mass., U.S.A.

Here's why Foxboro Anti-Ambi Recorders are more accurate . . .



This diagram shows the Foxboro automatic compensation for ambient temperatures. Measuring and compensating elements are located in the same case, and capillaries for both systems are in the same protective tubing. Compensating system (B) continuously corrects the primary measuring system (A) for ambient temperature changes.

Here's the small-diameter, quick-response bulb used with the Foxboro Anti-Ambi Thermometer. Bulb is made with a stainless steel neck to reduce conduction effects.

The bulb is generally protected by the special socket shown above. It has aluminum fins for rapid heat transfer, and a stainless steel extension to minimize heat conduction to the socket head.

FOXBORO REG U S PAT OFF — **Anti-Ambi THERMOMETERS**

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

and productions 12.6 per cent below 1953. . .

"The domestic oil industry now is . . . operating at the highest level in its history. In face of this evidence of prosperity, we believe that to take steps now which would impair free trading in oil with foreign producing countries in both hemispheres which are friendly to us would be very unwise and would only play into the hands of those who would destroy the free world. . .

"It is our intention . . . to comply, within reasonably operational limits, with the formula for oil imports suggested by the Cabinet Committee on Energy Supplies and Resources Policy."

Statement from The Texas Co.

Best Ever Printed

Dear Sir:

Enclosed please find $2. I would like to have two additional copies of your exploration issue of The Oil and Gas Journal, dated April 4. In my opinion, it is the best issue that you have ever printed.

Arthur J. Coyle
Coyle-Concord Oil Co.
San Antonio, Tex.

A.P. I. and A.G.A. Figures Defended

Dear Sir;

Your editorial on page 75 of your March 28 issue concerning the 1954 reserves report of the A.P.I. and A.G.A. requires some comment. It makes certain insinuations which are uncalled for. I do not intend to go into any detailed explanations, but I do wish to point out—and this has been clearly stressed for many years—that:

. . . **This annual report** by the reserves committee of A.P.I. and A.G.A. is always purely factual; in it we never attempt to philosphize.

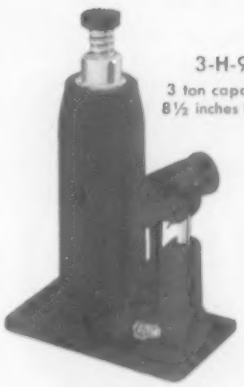
. . . **The figures presented** in the report are the best that can be arrived at after careful and mature study of all pertinent data by trained geologists and engineers.

. . . **If, through production** history and observation of well performance, the committee finds that its previous estimates were too low, it raises these estimates; and if too high, it lowers them.

Its aim is to be as fair as possible in its conclusions, without leaning too far toward the conservative side, nor too far in the contrary direction.

With these principles and objectives in mind, those who refer to the annual reports of the A.P.I. and A.G.A. committees should accept them with proper understanding. We are not catering to Government, nor to industry, nor to any other group or organization. We are giving our unbiased opinion on

These Modern Jacks Can Lift Heavier Loads With Less Effort!



These precision built jacks require much less effort to operate than mechanical type jacks because they utilize the hydraulic principle—a pump does the work.

Duff-Norton Hy-Power Hydraulic Jacks, because of this ease of operation, are finding more widespread use in the oil fields for all kinds of heavy lifting and pushing jobs. They are standard equipment on many rig builders' trucks and on drilling rigs.

There are ten Duff-Norton Hydraulic Jacks with capacities from 3 to 50 tons. All models can be equipped with gauges calibrated to show exact weight of load being lifted.

See these time and energy saving hydraulic jacks at your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks for complete specifications. Ask for Hy-Power Hydraulic Jack Bulletin AD16-B, Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON
Jacks

"Giving Industry A Lift Since 1883"

Now... SILICONES ADDED

for EXTRA THREAD INSURANCE

in Dragert's

big D Dope

THE ONLY 90% METALLIC LEAD ALL-PURPOSE THREAD COMPOUND

AT NO EXTRA COST!

DRILLING ENGINEERS who first discovered "BIG D's" matchless sealing, lubricating, protective qualities wanted extra insurance for threads against heat and moisture. So, Dragert chemists fortified "BIG D" with the wonder-plastic SILICONE.

Now, at no extra cost, "BIG D" affords easier, quicker assembly and disassembly . . . easier, smoother application even when pipes are swimming in water.

MONEY-BACK GUARANTEE

"BIG 'D' DOPE" is MONEY-BACK GUARANTEED to afford long-lasting ISLAND HIGH lead-plating protection to all threaded fittings. Warranted anti-wash-out, anti-gall, pressure-tight sealing under the most punishing pressures, temperatures, vacuums. Guaranteed to permit quick, easy, REPEATED make-ups and break-outs WITHOUT RE-DOPING.

FREE Sample Provides Positive Proof

Order Direct or Through Oil Field or Industrial Supply Stores

C. H. DRAGERT COMPANY, INC. P. O. BOX 5092 P
DALLAS, TEXAS

Please send me ☐ FREE brochure, "The Inside Dope on "BIG 'D' DOPE".
☐ FREE Sample of "BIG 'D' DOPE" for testing.

Name _____ Title _____

Company _____

Address _____ City and State _____

SERVING THE OIL INDUSTRY 15 YEARS

"proved reserves," and whether they are up or down, as compared with previous reports, they are our latest best judgment of the facts. They need no detailed explaining.

Frederick H. Lahee
Dallas
A.P.I. Reserves Committee
Chairman

CALENDAR OF EVENTS

MAY

2-6 American Gas Association, Industrial Gas School, Hotel William Penn, Pittsburgh.

5-6 American Association of Oilwell Drilling Contractors, 10th annual drilling industry safety clinic, Baker Hotel, Dallas.

9-10 American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.

9-11 10th Purdue Industrial Waste Conference, Memorial Union, Purdue University.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.

11-13 Canadian Institute of Mining and Metallurgy, Petroleum and Natural Gas Division, annual technical meeting, MacDonald Hotel, Edmonton, Alta.

11-13 American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.

12-13 Sixth Symposium, "Automation—Engineering for Tomorrow," School of Engineering, Michigan State College, East Lansing, Mich.

12-19 Sixth Latin American Congress of Chemistry, Caracas, Venezuela.

14-22 World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt, Germany.

16-18 American Petroleum Institute, Division of Transportation, products pipeline confrence, Edgewater Beach Hotel, Chicago.

16-18 Southern Gas Association, New Orleans.

19-20 Society of Exploration Geophysicists, 10th annual Gulf Coast meeting, Plaza Hotel, San Antonio.

20-22 Appalachian Geological Society, Virginia Geological Survey, and West Virginia Geological Survey, spring field conference, Kavannaugh Hotel, Harrisonburg, Va.

23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.

26-27 Western Petroleum Refiners Association, technical-industrial relations meeting, Settles Hotel, Big Spring, Tex.

26-27 American Institute of Mining and Metallurgical Engineers, Rocky Mountain Petroleum Sessions, Shirley-Savoy Hotel, Denver.

26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

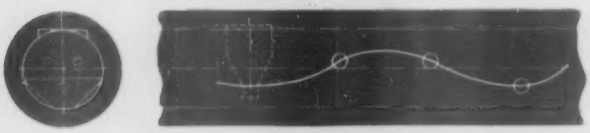
1-3 Tenth annual Short Course on Gas

WESTERN'S NEW ROCKET JET GUN...

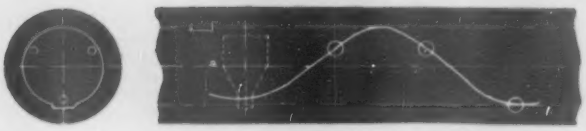
here's the how...

New WESTERN ROCKET Jet perforating principle through use of spring device in charge positioning brings you more effective application of jet force to target.

By shortening prima cord length as shown in "A" below, charge-to-charge interference has been eliminated thus allowing use of a larger charge for more effective jet perforating.



(A) ROCKET JET GUN



(B) STANDARD JET GUN

STANDARD JET GUN

Western's new engineering principle of charge positioning* in tubular jet guns brings you three major perforating advantages:

1. WESTERN ROCKET Jet Gun through charge placement provides more effective use of jet force.
2. WESTERN ROCKET Jet Gun through shortening of prima cord allows use of larger charge than standard.
3. WESTERN ROCKET Jet Gun provides superior perforating effectiveness with sureness of penetration and safety provided only by retrievable guns.

Taken all together, WESTERN ROCKET Jet advantages add up to this—186% larger entry hole . . . 50% greater excavation . . . 10% deeper penetration. Ask your nearest WESTERN engineer for complete data on this significant new advancement in jet perforating and learn how you can get finer, more effective perforating . . . ROCKET JET PERFORATING . . . at no extra cost!

ANOTHER "FIRST" FROM WESTERN RESEARCH

THE WESTERN COMPANY

General Offices: MIDLAND, TEXAS

ACIDIZING • FRACTURING • PERFORATING Jet & Bullet
GAMMATRON Radioactivity Well Logging

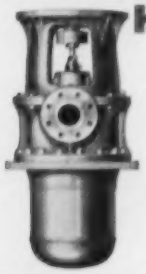
TEXAS: Ballinger; Borger; Levelland; Odessa; Seagraves; Snyder • OKLAHOMA: Cushing; Healdton • NEW MEXICO: Hobbs • KANSAS: Ulysses

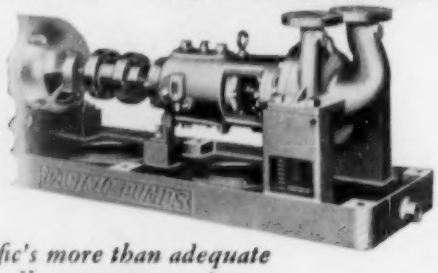
* Pat. Pending

Specify **Pacific**

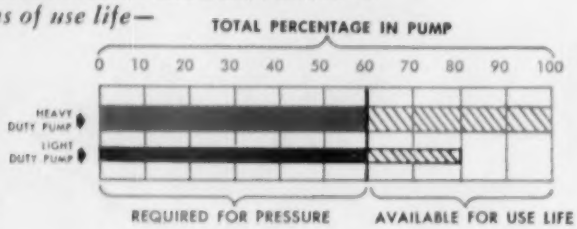
to get full use life
from your Process Pumps

PACIFIC PROCESS PUMPS
HORIZONTAL AND VERTICAL ARE STRICTLY
HEAVY DUTY PUMPS

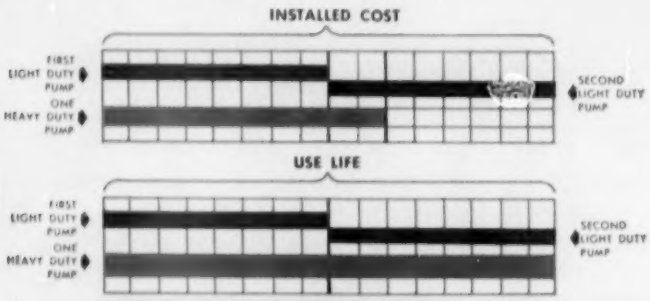




Here is what Pacific's more than adequate corrosion-erosion allowance means in terms of use life—


TOTAL PERCENTAGE IN PUMP
0 10 20 30 40 50 60 70 80 90 100
HEAVY DUTY PUMP
LIGHT DUTY PUMP
REQUIRED FOR PRESSURE
AVAILABLE FOR USE LIFE

Here is why Pacific's heavy duty process pumps are more economical—



PACIFIC
Precision Built
PUMPS
Pacific Pumps Inc.
ONE OF THE DRESSER INDUSTRIES

Write for Bulletins 105-R, 108 & 115

HUNTINGTON PARK, CALIFORNIA
Export Office: Chanin Bldg., 122 E. 42nd St., New York
Offices in All Principal Cities

CP-4

Technology, Texas College of Arts and Industries, Kingsville, Tex.

5-9 Canadian Gas Association, annual meeting, Sheraton-Broeck Hotel, Niagara Falls, Ont.

6-9 Oil and Gas Power Division, American Society of Mechanical Engineers, 27th annual conference and engineering exhibit, Hotel Statler, Washington, D. C.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

7-9 National Oil Scouts and Landmen's Association, 32nd annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

16-18 Interstate Oil Compact Commission, Cosmopolitan Hotel, Denver.

17 Northern California Section, American Institute of Chemical Engineers, symposium on waste disposal, University of California, Berkeley, Calif.

20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.

23-24 Western Petroleum Refiners Association, technical-industrial relations meeting, Broadview Hotel, Wichita, Kans.

23-26 Rocky Mountain Oil Show, Casper, Wyo.

26-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

13-24 First International Instrument Congress and Exposition, and ninth National Instrument Conference and Exhibit, Philadelphia.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

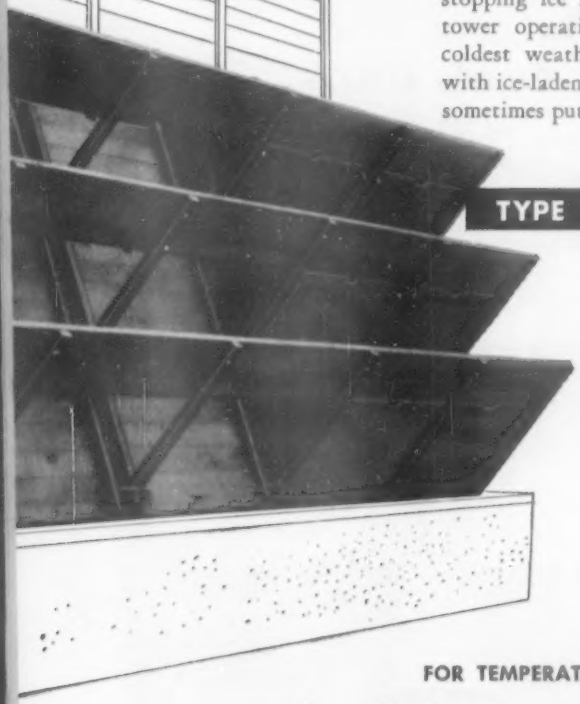
ONE MORE REASON TO CHOOSE PRITCHARD COOLING TOWERS:

PRITCHARD LOUVERS MAKE POSSIBLE ICE-FREE OPERATION IN COLDEST CLIMATES!

Ice formation on cooling tower louvers is a serious problem. Ice can break the louvers and also seriously damage the filling inside the tower. The tower is left inoperable—or, at best, operating inefficiently.

Before Pritchard developed Type WX louvers, there was no effective way of stopping ice formation or keeping the tower operating at peak efficiency in coldest weather. Operators of towers with ice-laden louvers shut off the fans—sometimes putting a canopy over the fan throat—in an effort to melt the ice. But the most they could accomplish was to prevent a further accumulation of ice. And often they couldn't prevent this. Then they tried reversing the flow of air through the tower. This did a partial job of getting rid of ice but also involved the purchase of costly reverse starters for the fan motors.

Now ice formation can be stopped before it starts—with the Pritchard Type WX louvers. One more reason to choose Pritchard!



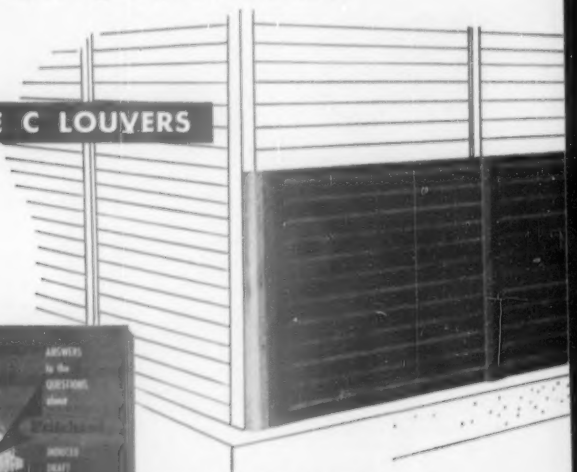
TYPE WX LOUVERS

Especially designed to eliminate ice formation in extremely cold weather operation. Wide louvers are supported in a frame set out from the tower to prevent splashing water from reaching the louvers and forming ice. Each louver is individually hinged, can be opened or closed to regulate air flow into the tower, thus controlling water temperature and stopping ice formation. The WX louvers can be shut off on the windward side, leaving the louvers on the other side open. In this way the tower can continue to function efficiently without danger of freezing. The entire operation can be done from the ground, adding safety and convenience.

FOR TEMPERATE CLIMATES

TYPE C LOUVERS

Louver boards are set at an angle on close centers vertically and are supported by slotted louver posts set close to the tower. All boards are individually removable for easy access to the basin. This design makes possible a neat, compact tower with minimum basin requirements.



NEW PRITCHARD INDUCED DRAFT COOLING TOWER BROCHURE

This new Pritchard brochure answers 15 questions about Pritchard Induced Draft Cooling Towers. Completely illustrated. Each feature described in detail. Large, cutaway drawing takes you inside a typical Pritchard tower. Interesting, informative. Send for your complimentary copy today on your company letterhead!

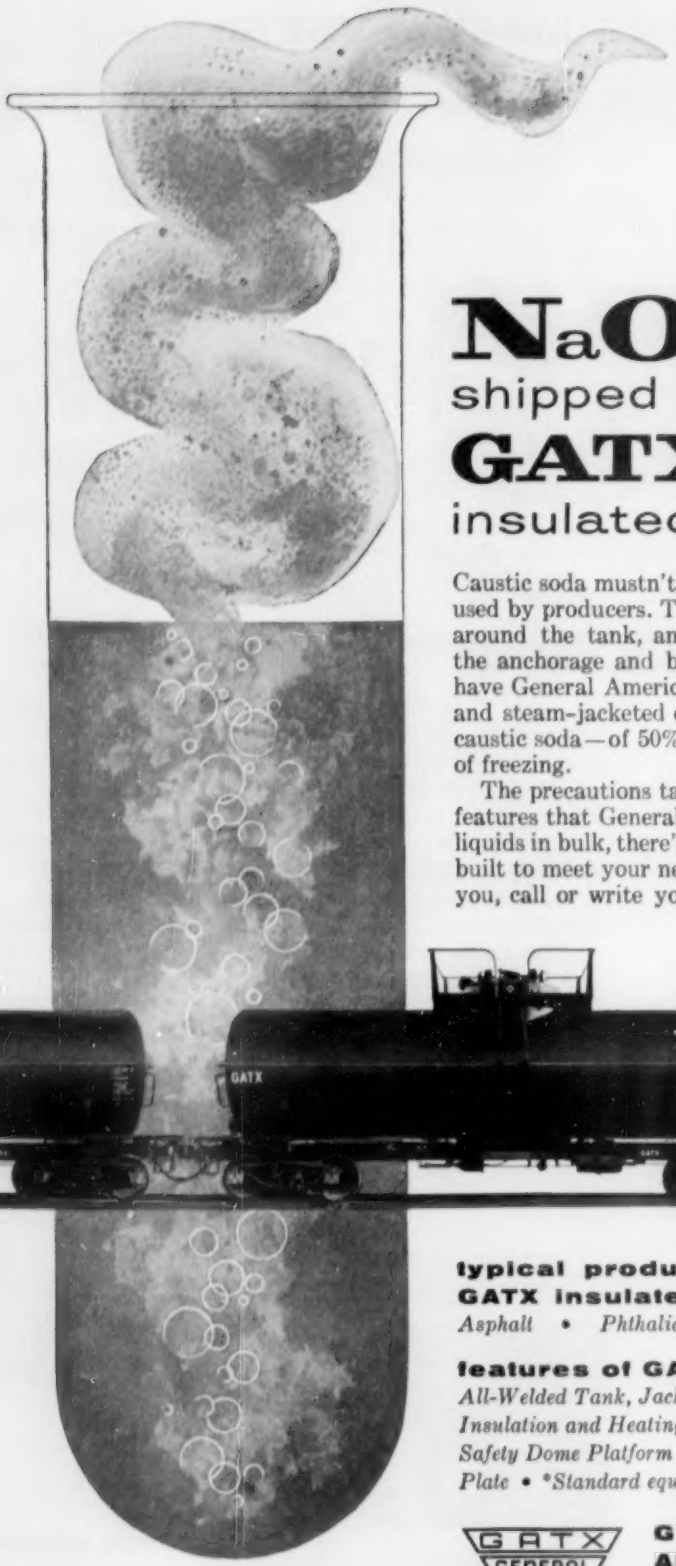
INDUSTRY'S PARTNER FOR PROGRESS

COOLING TOWERS
GAS & AIR TREATING EQUIPMENT

REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.

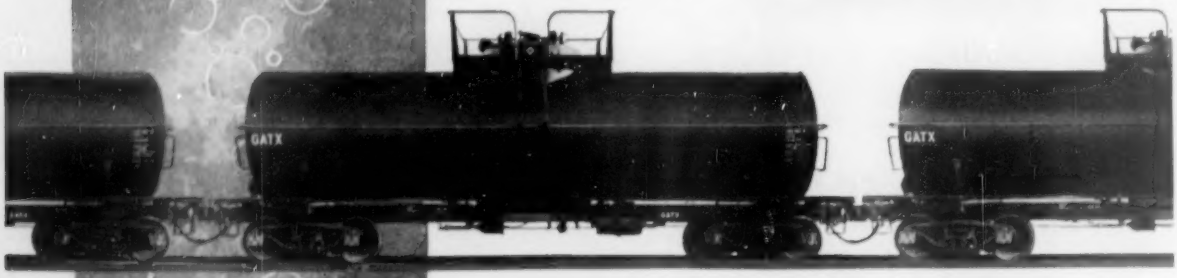
Dept. 486, 4625 Roanoke Parkway, Kansas City 12, Mo.



NaOH
shipped best in
GATX
insulated tank cars

Caustic soda mustn't freeze. That's why GATX insulated cars are used by producers. These tank cars have six inches of insulation around the tank, and also specially-designed insulation around the anchorage and bolster areas. In addition, caustic soda cars have General American's exclusive half-oval exterior heater coils and steam-jacketed outlets. Thus, manufacturers can safely ship caustic soda—of 50% and 73% concentrations—with little chance of freezing.

The precautions taken to protect caustic soda are typical of the features that General American builds into tank cars. If you ship liquids in bulk, there's a General American car that's built or can be built to meet your needs. To learn how GATX tank cars can help you, call or write your nearby General American district office.



typical products successfully shipped in GATX insulated tank cars • *Molten Sulfur* • *Wax Asphalt* • *Phthalic Anhydride* • *Wine* • *Rosin* • *Latex*

features of GATX insulated tank cars* *All-Welded Tank, Jacket and Underframe* • *Flued Dome Construction Insulation and Heating Coils* • *Choice of Interior Linings (Available) Safety Dome Platform (Available)* • *One-Piece Longitudinal Bottom Plate* • **Standard equipment unless otherwise noted*

GATX GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street • *Chicago 90, Illinois*

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, 3-6291
JOHN D. REILLY . . . Mid-Continent Manager
HARRY B. BULLEN . . . . . Representative

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
CHARLES A. WARDLEY . . . Eastern Manager
JAMES W. BROWNLEE . . . . . Representative
JOHN W. MEANY, JR. . . . . Representative

CHICAGO
105 West Madison Street, CEntral 6-2537
E. S. KLAPPENBACH . . Midwestern Manager
DAVID T. KENNEY . . . . . Representative
JOHN D. YODER . . . . . Representative

PITTSBURGH
106 Nelbon Avenue, FRemont 1-7775
ALFRED M. JONES . . . . . Manager

HOUSTON
Sterling Building, CHarter 4626
JOHN M. SPEARS . . . . . Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building, STerling 3074
GEORGE O. RUPPERT . . . . . Representative

LOS ANGELES
650 South Grand Avenue, VAndike 0772
DONALD O. HANSON . . . . . Manager

ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER . . . European Representative

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00, 3 years, $8.00. Single copies: regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1955 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING . . .

Research Payoff

A CURIOUS and little-known fact about the origin of the oil industry is that it really got its start in a research laboratory exactly 100 years ago this spring.

This is curious because, except for this one incident, it is quite true that "science came late to the petroleum industry." For two generations after the discovery of the Drake well in 1859, the rough and lusty oil business had virtually no use for scientists, not even geologists. Today, of course, research is a major activity, and science sways the course of oil.

But to get back to 1855 and the events leading up to the Drake well. Pennsylvania Rock Oil Co., the world's first oil company, had a lease on an oil spring near Titusville, Pa. It proposed to dig pits and collect the oil for sale. But the company couldn't raise any money because potential investors didn't know of any market for this rock oil, or "Seneca oil," except to rub on the skin as a possible cure for rheumatism, dandruff, fallen arches, and kindred miseries of the human body.

So, with inspiration born of desperation, the frustrated promoters sent a bottle of the spring's skimmings to Benjamin Silliman, Jr., professor of chemistry at Yale University. The prof ran a few simple distillation tests in his lab and wrote a brief report which was truly prophetic.

A simple and inexpensive refining treatment, Silliman said, would turn rock oil into an illuminant better than whale oil and a lubricant better than tallow. How right he was. He may even have had a vision of petrochemistry when he added that the stuff might be manufactured into many "very valuable products."

This is one research project that paid off handsomely all around. Silliman charged the enormous fee of $526.08 for his work, which was pretty good for a college prof to pick up on the side in those days. The company had a tough time scraping up the dough to pay this fee, but it made good use of the report in selling stock and soon had enough capital to begin operating.

Of course, the plan for digging pits and skimming off the oil didn't produce as much crude oil as expected. So "Colonel" Drake, the retired railroad conductor in charge of the field operation, had to resort to drilling. It took 4 years of profitless development work after the Silliman report before the company could begin to cash in on the results of its research project. But that might be considered something of a speed record these days.

Next week in St. Louis the A.P.I. Division of Refining will commemorate the hundredth anniversary of this first petroleum research project.

House of Correction

PUCKISH FATE has played an ironical trick on the city of Detroit. Detroit is now an oil and gas producer.

You may recall that it was the city of Detroit, together with officials of the State of Wisconsin, who initiated and prosecuted the case against Phillips Petroleum Co. which resulted in the Supreme Court decision directing the Federal Power Commission to regulate gas producers.

And Detroit officials are now among the leaders of the group urging Congress to require FPC to roll back field prices of gas to their prewar levels and to treat producers as public utilities and fix their prices on the basis of a 6 per cent return on actual investment.

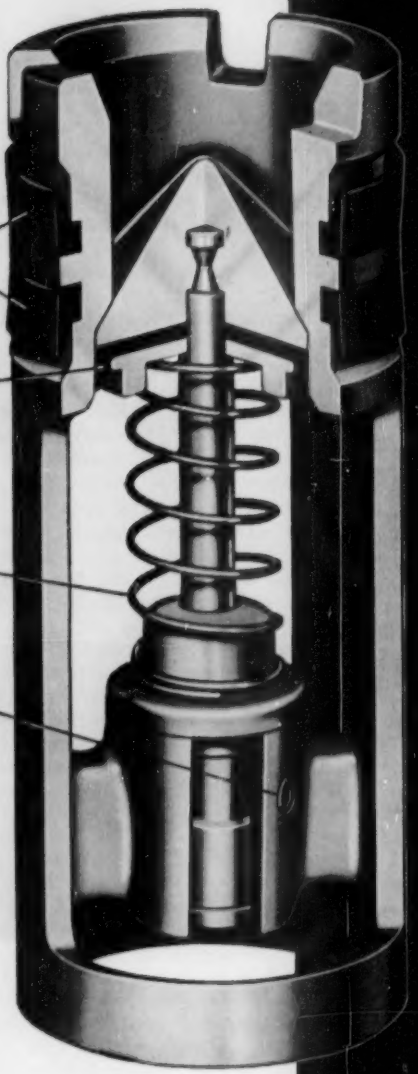
But right in the middle of this fight a big oil well has been brought in on the city-owned 1,192-acre tract of the Detroit House of Correction. Development work will proceed immediately, but already it appears that the city owns a gas reserve of 10 million cubic feet in addition to the oil. There are predictions that the city government can expect an income from its field of $150,000 per year—at current market prices.

But, of course, if Detroit officials are consistent they will welcome the FPC coming in and fixing their field price on the basis of what it cost to find the gas. Can't let these monopolistic producers gouge consumers and reap unconscionable profits, you know.

—Henry D. Ralph.

Now... better than ever...

Baker Drill Pipe Float Valve



SIDE SEALS REVERSED

to prevent distortion of seals by trapped fluid. Valve is easily removed.

MORE EFFECTIVE SEAL

The redesigned seal between the valve and the valve seat seals better—lasts longer—*stays in place* even under high circulating volumes and high pressures.

LESS SPRING TENSION

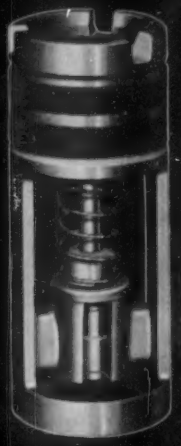
Reduces the cutting action of circulating fluid on the valve seal and seat.

GUIDE POSITIVELY ANCHORED

The valve guide is securely held in place by the set screw.

New!

BAKER MODEL "F" DRILL PIPE FLOAT VALVE



Baker Model "F" Drill Pipe Float Valve, Product No. 4813

Suggestions of drilling contractor and drilling department personnel have helped in redesigning and improving Baker Drill Pipe Floats so that they are *now better than ever*. They will save *you* time and money, muss and fuss, in every string.

POSITIONED WHERE DESIRED—A majority of operators install the Baker Drill Pipe Float Valve in a recess in the lower end of the drill collar where it is held in position by the pin on the drilling bit. Or the Valve can be positioned in a Drill Pipe Float BODY which serves as a tool joint sub at any point in the string.

EASILY INSTALLED AND SERVICED—The strong, simple Valve is made without threads and is merely dropped into place—or just as easily removed—by hand. No tools or wrenches are required. The inexpensive wearing parts are available at your supply store, and servicing is quickly and easily done right on the derrick floor.

The Baker Drill Pipe Float does so much; saves so much; and costs so little that we suggest you...

PICK ONE UP AT YOUR SUPPLY STORE—TODAY

BAKER

OIL TOOLS, INC.

HOUSTON · LOS ANGELES · NEW YORK

What they're saying against gas producers

A PRODUCER selling natural gas to an interstate pipeline is a monopoly and therefore, of course, his prices should be regulated.

That is one of the arguments being pressed by opponents of the decontrol legislation now before Congress. It is a sample of the propaganda and false statements that gas producers must combat to secure passage of a law to undo the damage of the Phillips decision.

Here's how the opponents reason: Once a transmission company connects to a gas supply it can't move its pipeline "like a garden hose" from one producer to another in search of lower prices. Therefore the supplier becomes a monopoly. The implication is left that the pipeline is completely at the mercy of the supplier and that he can use his monopolistic position to exact any kind of price and terms he chooses.

THIS DISINGENUOUS ARGUMENT is apt to fool a lot of people, including congressmen, who don't understand the nature of the gas business and the competition for gas supplies.

Under such a definition, practically any sales contract is a monopoly. You might as well say that when you enter a year's subscription to a magazine, that publication obtains a "monopoly" on your reading and therefore it should be regulated by some government agency.

It totally ignores the fact that before the line was built the transmission company searched perhaps half a continent for the best available supplies of gas. Then it negotiated the best contracts it could with potential suppliers. Both parties are henceforth bound by the mutually agreed-upon provisions of these long-term contracts.

ANOTHER FALSE NOTION being spread by the opponents is that price increases under escalation provisions are all "unmerited" and are suddenly sprung on unsuspecting purchasers by monopoly suppliers. The fact is that the escalation provisions were written into the contracts long ago. Purchasers understood them thoroughly, and agreed to them as one of the conditions for obtaining the gas.

A great outcry is being raised over the fact that field prices of gas have been rising since the end of the war. Completely ignored are the collateral facts that prices of nearly everything have been rising ever since the end of the war, that demand for gas has risen tremendously, and that the delivered cost of gas is still well below the cost of competing fuels or of manufactured gas in most places.

These specious arguments, and many more of the same ilk being spread by the advocates of federal control, must be answered by the facts. And the facts must be shouted from the housetops and pounded home at every opportunity. For the next couple of months this is a 24-hour-a-day task for everyone in the industry.

NOW – for complete plastic pipe service – just call Continental

MILLS PLASTIC I (SARAN)

FLEXIBLE – for air, oil and water lines, lubricating systems, food handling, beverages, vitamin oils and drugs, electrical raceways, etc.

MILLS PLASTIC III (BUTYRATE)

SEMI-RIGID – for salt-water disposal, vent lines, city water lines, renewal liners for gas lines, corrosive liquids and gases.

MILLS PLASTIC IV (POLYETHYLENE)

FLEXIBLE – for municipal water systems, two-pipe jet well transmission, underground water service, irrigation, transmission of corrosive gases, vapor, air, etc.

MILLS PLASTIC V (STYRENE-ALLOY)

SEMI-RIGID – for use where corrosion is a major problem, including transportation of brine, sour crude, acids, natural gas. Non-toxic; recommended for food processing. Also excellent for electrical raceways.

Now Continental brings you *four* different types of plastic pipe. Our experts are ready and eager to help you pick the kind and size best suited to your purpose. In addition, we are now making the complete line of plastic fittings formerly maufactured by Tenco, Inc., of Winona, Minn. Whether you are handling water, food or drug products, chemicals, sour crude, salt water or natural gas, we can give you the best in plastic pipe and fittings at one call. May we hear from you soon? No obligation, of course.

CONTINENTAL CAN COMPANY

MILLS PLASTIC PIPE DIVISION

SALES OFFICE: 100 East 42nd Street, New York 17, N. Y.

FACTORY: 2930 North Ashland Avenue, Chicago 13, Ill.

THIS WEEK . . . . . IN THE NEWS

Pipelines

• Trans-Canada Pipe Lines got its second wind last week after receiving an extension on permits to finance construction of its 2,000-mile line to eastern Canada. Under the extensions, the company has until October 31 to wrap up financing and until June 30, 1956, to start construction. Company officials are dickering independently with Quebec Hydro-Electric Co. to buy its gas-manufacturing and sales division. They would use the properties to move U. S. natural gas into the Quebec market until Trans-Canada gas is available.

• It won't be long before Pacific Northwest starts building its big-inch line from the San Juan basin to Washington. The SEC approved the financing last week to erase the last problem standing in the way of construction. Work is expected to start late this month.

International

• Subsidiary of Standard of California signs agreement for exploration rights in southern Argentina. The agreement is first of its kind to be reached with Argentina in nearly 20 years. It still must be approved by President Peron and Argentine Congress. Other companies are negotiating for similar concessions.

• Crude output in the free world reached all-time high in February. Latest figures show production averaged more than 13,400,000 bbl. daily.

Petrochemicals

• Look for Phillips Petroleum Co. to move up front in polyethylene. The company has unveiled plans to build its first plant using new low-pressure, low-cost process near Houston. A second plant and connecting pipeline also are planned to supply the ethylene raw material. Phillips claims its new polyethylene is much superior to present supplies.

Imports

• Senate finance committee turns down Neely amendment. It proposes giving President Eisenhower the responsibility of ordering cuts if and when they threaten national security. Bill to do this goes to Senate floor this week. It's given a good chance for passage as written.

• I.P.A.A. votes to continue fighting for quota on imports. Association directs officers to keep plugging for the Neely bill and to adopt any other plan to prevent "continuation of destructive and excessive oil imports."

Refining

• Because of stiff competition in the refining industry, processing arrangements are becoming more and more common. In the past, such deals usually were made only in emergencies which caused one or more refineries to be shut down. Now, it is quite common for one refiner to process crude or other charging stock for another refiner. It permits more economic operation and in some cases it may mean the difference between a profit and a loss. Some refiners believe processing deals will become even more common in the future.

Economics

• Total demand for 1955 now expected by I.P.A.A. to average 8,474,000 bbl. daily, up 4.5 per cent over 1954. New estimate is 104,000 bbl. daily above I.P.A.A.'s forecast made last October.

• First-quarter reports of major companies show much higher earnings than in 1954. Last year's operations generally showed no increase in income, except for the major importing companies.

Production

• U. S. crude-producing capacity will increase 473,000 bbl. daily this year, the I.P.A.A. estimates. The projected gain is considerably below the 516,000 bbl. per day increase in 1954.

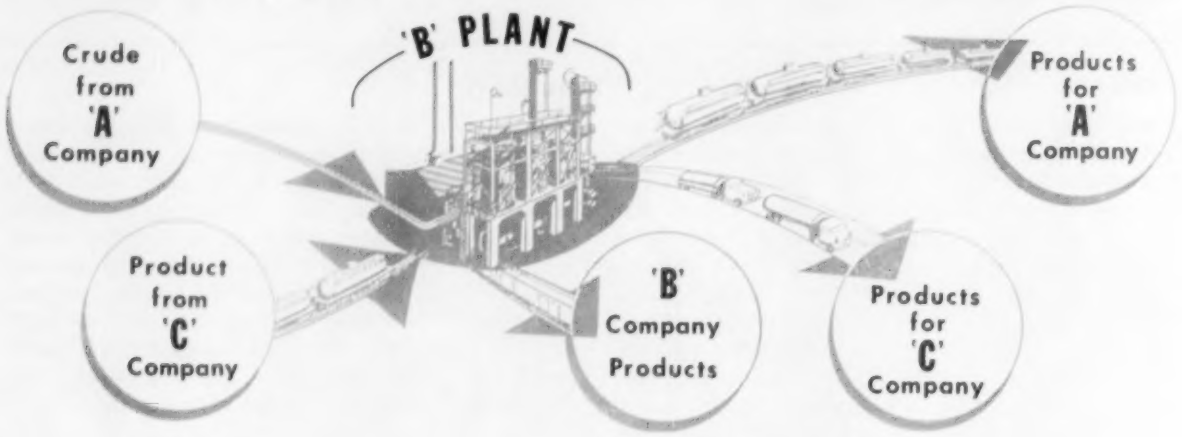
• Water floods in California may be overcoming two of their greatest handicaps—thick oil sands and high oil viscosities. N. van Wingen, Los Angeles consulting engineer, said these two problems may not be the stumbling blocks they were expected to be.

Natural Gas

• The Harris bill left the House interstate commerce committee last week headed for the Senate, but not without natural-gas consumers getting their licks in. Consumers may win a partial victory by getting escalation, favored-nation, and similar clauses killed in future gas contracts. There was no indication they swung the House their way on federal control of producers.

Exploration

• The oil industry has its work cut out for it during the next 50 years. J. Brewster Jennings, Socony-Vacuum president, says the industry must find some 990 billion barrels of oil by 2000 A.D. Unless the new oil is found, the industry may lose its dominant position in the world energy picture.



Interplant Processing . . .

Answer to Diminishing Margins?

• One phase of increasing competition in the oil industry is the spread of interprocessing arrangements among refiners to lower costs.

• Is the recent increase in such arrangements a temporary trend? Or does it reflect basic changes within the oil industry which will have more permanent significance?

C. O. Willson

MOST observers who are familiar with past and present conditions in the refining industry apparently feel that the current outbreak of intercompany manufacturing agreements will end shortly. Many expect an early return to normalcy. They think interprocessing arrangements again will become a rarity.

But there are other students of the industry who disagree—and for a reason. They contend that situations in which a refiner processes crude oil or other charging stock for other refiners will increase in numbers and in importance. They foresee such deals as a permanent phase of manufacturing operations.

This conclusion is based on the current trend toward increased competition. Many factors contribute to this trend—new developments in manufacturing methods, excess plant capacities, higher operating costs and reduced profits, changes in product specifications, surplus crude supplies, variations in transportation costs, and shifts in markets.

Refiners for years have relied on interprocessing arrangements in cases of emergency. Usually they were brought about by strikes, fires, or other situations which forced one or more refineries to be completely or partially shut down. Operations then were taken over by other plants, usually in the same area and with similar crude supplies.

In such a case, the company which was temporarily unable to supply its customers took its share of products from common storage at another company's plant. If the crude supply of the principal differed from that of the processor, they reached an agreement on products yield based on laboratory or pilot-plant operations.

There was little or no bargaining in these arrangements. In fact, cases are cited in which the principal and processor did not get together to agree on fair charges for the operations until the processing was completed and both plants had returned to normal operations.

The objective of these arrangements was to aid in an emergency and also in the case of labor difficulties assist other operators in maintaining a position of importance to the entire refining industry. It is assumed that these arrangements will continue whenever and wherever they appear desirable.

New developments . . . But several of the present processing programs have an entirely different base from that just outlined. They have been brought about by developments in producing, refining, and marketing branches of the oil industry with no indications that these conditions will change in the near future.

In the case of refining, the oil industry for some time has had excess capacity. This was brought about primarily by Government's defense program in which refinery operators were urged to provide excess capacity for a possible national emergency in which military requirements would greatly expand and outside supplies would be curtailed or shut off entirely. This program included not only the general refining practices but also processing used in the manufacture of aviation gasoline and other specialty products.

Due to this defense program many refiners have excess plant capacity with present crude to stills running from 85 to 90 per cent of the national capacity. If all plants were operated on the national average no great hardships would be involved. But the plant operations vary from more than 100 per cent of rated capacity to 75 per cent or less.

Those with the lowest percentages

find themselves in a position in which their processing costs have increased materially in the face of unsatisfactory prices for refinery products. In the case of independent refiners whose manufacturing operations determine company profits or losses, this situation in many cases resulted in losses in 1954 and 1953. There is no assurance there will be sustained improvement this year.

The position of the refineries which are part of larger integrated organizations does not differ materially from that of the smaller plants except that the owning companies have profits in other divisions of operations to offset manufacturing losses. In practically all cases there is pressure to bring about operating changes which will place refining on a more attractive basis, and that fact is often controlling in interprocessing arrangements.

Attractive propositions . . . This has brought about a situation in which a refiner who has excess capacity can make an attractive proposition to another refiner who also may be experiencing the higher costs of part-capacity operation or whose own operations may be unsatisfactory for other reasons.

In these cases some refiners are reported to be willing to process for other refiners at costs which are below their average figures. The additional processing lowers their over-all costs and they end up with realizations which are more attractive than when they were operating 15 to 25 per cent under capacity. The principal also benefits from a manufacturing cost less than that prevailing at his own refinery. In some of these situations it is said the principal expects to charge off a loss of a plant with savings in processing costs.

In these situations there is bargaining. It is agreed that the top 10 to 25 per cent of a refinery operation is the lowest in costs per barrel of refining, and some benefits are being passed on to the principal in the interprocessing contracts. But it is also reported that a few refiners who have made substantial concessions to obtain capacity operation at their plants have found that the agreements were not as favorable profitwise as they expected, and they are not as inclined to give the same concessions in new agreements.

There is always the possibility that refinery realizations will improve and the principal company will be able to resume profitable operations at its own plant before it becomes obsolete.

Installation costs . . . Other conditions have been factors in bringing about processing arrangements between refiners. With refinery realizations low, it is becoming increasingly difficult for some refiners to finance installations needed to keep pace with the quality race in petroleum products. This is particularly true of the smaller refineries, but it also is a factor at some of the larger plants.

A refiner often can save money by having one or more products processed at another plant rather than install expensive equipment but at the same time continue normal operations at his own plant. The matter of whether or not a refiner has a well-balanced catalytic cracking and catalytic reforming capacity has entered into arrangements of this type.

In at least two Mid-Continent situations the fact that refiners have facilities to carry on coking operations brought about the processing agreements.

In general, residual-fuel-oil quotations in the Mid-Continent and many other refining areas have been unsatisfactory in relation to crude-oil prices for several years. Coking of the residual is one of the answers, but many refiners feel that installation cannot be justified where small capacities are involved. This has resulted in programs in which the main objective is to obtain the savings from coking for both the principal and the processing company which has the coking facilities. In one instance at least the processing arrangement ends with the overhead products, the processor buying the residual of the principal at the published prices and carrying on the processing from that point to a nonresidual operation.

Charging stocks . . . Specifications of the charging stocks of the various refinery operations, starting with crude oil at the wells, are factors in the desirability of entering into interprocessing procedures. More and more refiners are segregating their crude-oil supplies rather than taking the common stream which is a blend of several grades of crude oil.

The advantage of the segregated or batch operation involves not only the atmospheric and vacuum crude-oil distillation but extends through the cracking and treating operations. The net result is that one refiner may have an important advantage over another although they are paying the same posted prices (based on gravity) for their crude oil. The favored refiner obtains higher-octane gasoline, better grades of kerosine and diesel fuel, less residual, or some other product advantage over his competitors.

This has resulted in agreements in which the processor not only does the processing but also furnishes the crude oil for the principal, who then gives up part or all of his own crude connections. It is apparent that variations in gravity are often no longer a gage of crude-oil value in modern refinery operations. It is agreed that the only answer to this problem is a more realistic manner of arriving at posted prices for crude oil at the wells.

The variations among refineries in processing equipment and quality of charging stocks have a part in current processing contracts involving gasoline quality, and according to some observers they are certain to increase in importance.

Significance of octane . . . The octane race of the postwar period has had many ramifications, never more apparent than at this time. A few refiners are attempting to maintain a lead in the octane ratings in both their regular and premium-grade gasolines and also in the use of additives.

Scales in prices reflecting the higher costs of boosting octane ratings are becoming more and more common among refiners. For instance, one Mid-Continent refiner makes the following additional charges for motor fuel including products shipped in a pipeline with which the company is affiliated:

Research octane:	Additional cents per gallon
83-86	0.08
86-90	0.1
90-93	0.16
93-95	0.2

The scale of another company is:

Research octane:	Additional cents per gallon
83-86	0.086
86-90	0.125
90-93	0.167
93 plus	0.236

Assuming that the two companies charged the same price for 83-octane, the first refiner would ask a premium of 1.52 cents per gallon for 95-octane. The premium price of the second refiner would be 1.731 cents per gallon.

There are cases in which the refiner can effect savings by tendering crude oil for processing rather than relying on exchanges or purchases. As previously explained, the yield of other products enters into these arrangements. So do the type of crude available and its delivered price at the point of processing.

There are also cases where a refiner has run out of exchanges in certain areas and cannot buy the product desired. He has no choice but to arrange for the processing of additional crude oil at the most advantageous point.

Other products . . . These situations are not confined to gasoline. A case is cited involving two large refiners. One refinery has the facilities and charging

stock for the manufacture of high-octane gasoline at comparatively low cost. The second refiner has a lower-gravity crude supply which gives large yields of middle products desired by the first refiner. The second refiner also manufactures asphalt not obtainable commercially in the first operations.

Interprocessing programs have been worked which represent savings to both operators.

The surplus supplies of crude oil on a national and world-wide basis are responsible for some processing arrangements. The producer needs an outlet for his crude oil. He is willing to take the refinery realization after his crude has been processed and the products sold, but his net may be lower than the rated crude price. Such an arrangement is also attractive to the refiner who may be faced with a situation in which losses in plant operations are assured if he pays the posted prices for the crude oil available in his area. The present excess crude supplies along with a disparity between crude-oil price and refinery realizations point to an expansion in these arrangements as the only way out for both producer and refiner.

Other conditions in the oil business have a bearing on the desirability of interprocessing arrangements between refiners. Comparative pipeline charges in the movement of crude oil and the wide advantage of product pipelines over rail transportation are factors of increasing importance.

Result of competition . . . As previously indicated, these programs were never considered by most refiners during the early postwar period when there were shortages of crude oil and products with adequate margins for refinery and marketing operations.

Now a small fraction of a cent per gallon on products or a few cents per barrel on the crude-oil charge at refineries is of major importance in the profit or loss of small and large operations, and the difference may lie in whether a refiner does all of his own processing or "hires" another refiner to do part or all of it.

A veteran refiner points out that refining is one of the few major manufacturing operations in which the complete process generally takes place in one plant. He explains that the common practice among manufacturers is for them to produce part of their finished products and purchase materials from others to complete assembly of finished products. He feels that the time may have arrived when this same end may be accomplished at refineries not only through the exchange of products but through processing programs in which emphasis is placed on the most economical operation at each plant.

Big computer is expensive, but . . .

. . . The Answers Pay Off

DALLAS.—The biggest and fastest electronic computer yet installed in an oil exploration and production research lab has been put to work by Magnolia Petroleum Co. here.

The machine, a digital-type computer, was manufactured by Electro-Data Corp., of Pasadena, Calif. It cost Magnolia $169,000, and auxiliary equipment on order will run the total up to about $180,000.

The fruit of the computer's work on tedious exploration and production research problems will benefit the company's parent firm, Socony-Vacuum Oil Co., Inc. and other affiliates as well as Magnolia.

Prospects are that the brain won't get much rest. Magnolia already has lined up complex research problems which will take the machine a full year to complete.

One of its first jobs will be to make subsurface mapping more accurate by correlating data from various well-logging methods with that obtained from surface seismograph work. Magnolia hopes this will help the company pinpoint more potential oil traps.

The job, as stated, doesn't sound so formidable, but it is. A really thorough analysis of only one set of seismograph records—to fill in the "gaps" that have always existed from present methods — might require feeding as many as 2,000 bits of data into the machine.

The machine also may be assigned to:

. . . **Determine** whether pressure, volume, temperature, and fluid-viscosity relationships now generally accepted can be locked into an iron-clad set of inter-relations.

. . . **Analyze** qualities of materials as an aid in design of production tools.

. . . **Calculate** such statistical production information as estimated crude-oil runs.

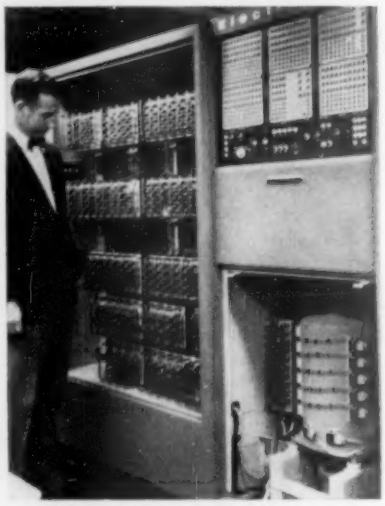
. . . **Try to determine** the relationships between porosity, composition, grain size, and other characteristics of oil sands.

. . . **Assess** equipment performance.

. . . **Figure** future behavior of oil reservoirs.

That is a big order, but Magnolia feels its computer can fill it.

How the wheels turn . . . As well as being the largest digital computer in a production lab, the Dallas instrument, together with a twin unit, is the largest in use by a United States oil company. The twin computer was installed a few months ago by Socony-Vacuum in its research and development (refining) labs in Paulsboro, N. J.



HUNDREDS OF VACUUM tubes and many, many miles of wire go into this ElectroData computer of Magnolia Petroleum Co. Some of the 1,525 vacuum tubes are shown on the left of the picture. The memory drum of the huge instrument is at the lower right. J. T. Nipper, the electrical engineer whose job is maintaining the "brain," is standing at the left.

The brain's measurements are 12 ft. long, 6 ft. high, and 2½ ft. wide—so bulky that Magnolia had to knock out a wall in its lab building to hoist the equipment into location.

The computer uses a 10-hp. motor to drive three generators for d.c. power. Magnolia had to install a 7½-ton air conditioner to combat the heat (45,000 B.t.u. per hour) which the machine produces.

It can add or subtract 500 ten-digit numbers a second, multiply 120 a second, or divide 85. Problems can be fed into the machine and answers withdrawn either on a special electric typewriter or by means of a photoelectric reader.

Leans on people . . . In spite of its versatility, the computer can't do much without the right kind of people. Magnolia has assigned nine highly-trained technicians to furnish this help.

Directing this work are Julius Aronofsky, in charge of Magnolia's applied-mathematics group and a specialist in the field of elasticity and the flow of fluids through porous rock, and O. D. Ferris, who codes and programs problems and supervises actual operation of the computer.

Phillips Unveils Big Polyethylene Plan

First plant using new low-pressure, low-cost process is set for Houston; ethylene plant, pipeline also planned

John C. Reidel

BARTLESVILLE. — Phillips Petroleum Co. has taken the wraps off plans for a multimillion dollar polyethylene plant construction project on the Gulf Coast which may well revolutionize a segment of the petrochemical industry.

The chemical world has been keeping a close watch on Phillips' work in polyethylene, a basic ingredient for a variety of plastics products. Phillips claims a superior polyethylene—Marlex—and a less expensive low-pressure catalytic process for making it.

Such a combination well could put Phillips in a dominant position in the field if pilot tests proved early prospects correct.

The announcement by K. S. Adams, chairman, and Paul Endacott, president of Phillips, that their firm will invest millions in two plants and a connecting pipeline was taken by observers to indicate that Phillips had perfected both the product and process.

Phillips will start work immediately on an ethylene plant at its refinery near Sweeny, Tex., capable of turning out 145 million pounds of the product a year. At the same time another large plant to produce Marlex from the ethylene made at Sweeny will be built at Phillips' Adams Terminal chemical works on the Houston Ship Channel near Pasadena.

These two installations will be linked by a pipeline which will send the ethylene from Sweeny to the polyethylene plant at Pasadena.

New family . . . At the same time, Phillips announced that a large, new building will be erected near Bartlesville to house the company's research equipment and the scientists who developed the new polyethylene and now are at work on a variety of other petroleum and chemical problems.

The polyethylene development may consolidate Phillips as a top company in chemicals. It already is a young billion-dollar giant with a big stake in oil and natural gas besides petrochemicals.

Phillips' researchers claim they have developed "a whole new family of improved polyethylene plastics produced by unique processing conditions which may change the polyethylene segment of the industry."

Two members of this new family have been revealed. One is Marlex 20. It is suggested for blending with present commercial polyethylenes for a product with greater resistance to heat and water vapor penetration. The other is Marlex 50, said to possess remarkable strength, toughness, and flexibility.

The Marlex twins are ideal in products resistant to chemicals, penetration by moisture, gases, and solvents. They do not become brittle at temperatures as low as 175° F. below zero. Contrary to conventional polyethylenes, which soften at temperatures below the boiling point of water, Marlex does not soften or deform at steam sterilization temperatures as high as 250° F.

Lower investment . . . These properties make them adaptable to such plastics products as containers and thin film materials for packaging, paper coating, electrical insulation and vessels subject to heat sterilization.

Even more important from Phillips' viewpoint is its new polyethylene process which requires a lower plant investment. The Phillips' process operates at less than 500 psi. and is accomplished with the aid of a catalyst. Present polyethylene units of competitors operate at pressures of 15,000 to 30,000 psi.

Phillips officials stated they believed the demand for Marlex will be so great they will be in a position to license the process to others in the near future.

Phillips has skyrocketed to the top in the petrochemical field from a small beginning in 1939. Since then it has become a major producer of carbon black, synthetic rubber, fertilizers, synthetic fiber intermediates and a variety of byproducts of its natural gas and refining operations.

In 1939 Phillips started out with pilot plant work on furnace-type carbon black. Four years later it built the first Philblack "A" plant near Borger and the same year began to operate the Plains butadiene plant for the Government. A copolymer plant was added in 1950. These installations were acquired by Phillips from the Government this year. They have an annual capacity of 63,000 long tons of synthetic rubber.

Product tie-in . . . Phillips' large output of carbon black ties in with its synthetic rubber plants in a number of end products. The company developed the "cold rubber" process. At its Borger plant Phillips manufactures Philblack "A," a medium abrasion furnace black, and Philblack "O," which imparts wear-resistance properties to tire treads. The Borger plant makes about one-third of the world's supply of furnace blacks.

Entrance into the fertilizer field came in 1948 when Phillips leased from the Government the Cactus Ordnance Works at Etter, Tex., which makes anhydrous ammonia from natural gas. The company in the same year built ammonium sulfate facilities at Adams Terminal and quickly added a large anhydrous ammonia and triple superphosphate installations. All Phillips needs now to become fully integrated in the fertilizer business is to install facilities for potash production.

Phillips' sale of cyclohexane reached a new high in 1954. This nylon intermediate is separated from natural gas liquids in the firm's Phillips, Tex., superfractionator plant. The company also started up production of methylvinylpyridine last year when the original contract purchaser resumed purchase of the product for production of another synthetic fiber.

Until recently Phillips was the only company making p-xylene of greater than 95 per cent purity. This petrochemical which goes into the manufacture of Dacron, is separated by fractional crystallization in facilities located at Big Spring, Tex., adjacent to the Cosden Petroleum Corp. plant. Cosden furnishes the mixed xylenes feed stock from its catalytic reforming and aromatics separation operations.

Phillips started as a $3 million organization and during the 10 years ending in 1953 tripled its assets. Total assets for 1954 were given at $1,093,000,000. Gross income was more than $796,000,000 with a net in excess of $76,000,000.

The firm is rated in No. 8 position among major oil firms in its crude reserves and is No. 2 in reserves of natural gas. It operates 26 wholly owned and 4 joint-interest natural gasoline plants and holds an interest in 10 plants operated by others. The company also owns a wax plant in Venezuela where it has holdings.

I.P.A.A. Will Carry On Imports Fight

Officers ordered to adopt any action to halt excessive flood of foreign oil; speakers deride "voluntary" plan

Henry D. Ralph

SAN ANTONIO. — The atmosphere was tense with anxiety at the final session of the midyear meeting of the Independent Petroleum Association of America here last week.

In Washington the Senate finance committee was nearing a vote on the Neely Amendment to the Reciprocal Trade Act that would limit imports of foreign oil to 10 per cent of domestic demand, an amendment strongly supported by the I.P.A.A. and 20 other oil associations.

With telephone wires kept open for word that did not come by time of adjournment, the meeting talked about virtually nothing else but the overwhelming necessity to protect domestic oil producers by a government-imposed quota on imports.

It adopted a resolution calling on association officers vigorously to pursue the legislative program then hanging in the balance and to adopt any other plan of action "so as to prevent the continuation of destructive and excessive oil imports."

Fortifying its action, the association heard reports from its committees showing that:

... **Imports** will be 12 per cent higher than last year but domestic production will rise only 4.5 per cent, based on the 1955 forecast of supply and demand.

... **The United States** has capacity to produce 1,838,000 bbl. per day more crude than was produced last year, and this shut-in capacity will increase during this year unless imports are curbed.

... **It now costs** 4½ times as much to find and produce a barrel of oil in this country as it did before the war.

The meeting wasted no breath criticizing importers nor in asking them for voluntary restraint. It accepted the premises laid down in the opening address of President William M. Vaughey that:

... **It is to the economic** advantage of the owners of foreign oil to bring all they can into the United States, so only a law will curtail imports.

... **The foreign policy** of the U. S. Government has been to encourage imports for the benefit of foreign countries even to the detriment of domestic industries, and Congress must reverse this policy at least in so far as oil is concerned.

Already, Vaughey said, events have demonstrated the futility of the request for voluntary action to control imports made by the Cabinet Committee on Resources Policy. Since that report, he said, some big importers have reduced their schedules, but imports are still scheduled 11 per cent above the 1954 level—a violation of the cabinet request to hold the 1954 line.

Sets up principle . . . Besides, Vaughey added, laws and policies of this and of foreign governments make it impossible for importers to take voluntary action to restrict imports.

The percentage quota of the Neely Amendment is less important, Vaughey said, than establishment of the principle that Congress shall make an equitable division of the home market between domestic and foreign oil.

There was no discussion of the imports resolution when it was presented by R. G. Lawton, chairman of the imports policy committee. Lawton himself spoke only briefly, saying that victory seems near in the long fight to restrict imports and that the Neely Amendment will cure the problem.

But Charlton Lyons, last year's president of the association, later took the floor to warn that passage of the Neely Amendment will not end the struggle and that the I.P.A.A. must be prepared for a continuous effort to keep imports adjusted to an equitable relationship to domestic supply and demand.

A somewhat similar warning was sounded by Chairman William J. Murray, Jr., of the Texas Railroad Commission. Without taking a specific stand for or against the Neely Amendment, Murray said if Congress fails to impose the quota system the future of the independent and the domestic petroleum industry will be dependent on voluntary actions of the big importing companies.

Hazards ahead . . . Murray said this leaves a rather precarious situation and told the independents they badly need to better acquaint the public with the hazards to our national security and the jeopardy in which new domestic consumers place themselves by permitting imports to supplant domestic production.

The Texan added, however, that the Neely Amendment was not the complete answer. He pointed out that allowing a governmental agency to assign quotas to various importing companies might lead to assigning quotas to various oil-producing states.

He said the situation "requires the most statesmanlike, unselfish, farsighted deliberation that can possibly be given to this problem."

Gov. William G. Stratton of Illinois, chairman of the Interstate Oil Compact Commission, told the gathering that with a shut-in capacity in the U. S. exceeding the amount of imported petroleum "I cannot come to any other conclusion than that importation is supplanting domestic production."

Stratton declared voluntary efforts to curb imports will fail and said congressional action is necessary.

The most outspoken attack on imports came from Walter S. Hallanan, president of Plymouth Oil Co. and chairman of the National Petroleum Council. He endorsed the Neely Amendment and said importers brought the action on themselves "by closing all doors except this one to any responsible settlement of the question."

Hallanan warned survival of the domestic oil producer is in the balance and it is a case of fight or die. He assailed critics of the Neely Amendment who profess to recognize the enormous damage done to the domestic producer by excessive imports, piously proclaim their devotion to the cause, but say the solution proposed by the I.P.A.A. is wrong.

He said the trouble with these critics is they do not offer any alternate solution, adding: "I would not say that their purpose has been to impose a handicap upon the efforts of those who are earnestly seeking the answer to the import problem, but nevertheless that is the undeniable effect of their criticism. Their sole contribution has been to muddy the water."

He classified as a "fanciful dreamer" any who think reasonable restraint upon imports can be obtained through voluntary action by the importers.

Pipeline Plans Announced

OKLAHOMA CITY.—Cities Service Gas Co. has announced plans to spend over $8,000,000 expanding its present natural-gas system in Oklahoma and Kansas.

In an application filed with the Federal Power Commission, the Oklahoma City firm said that it would build a 93-mile, 26-in. line between Blackwell, Okla., and Independence, Kans., plus 145 miles of gathering lines in Woods County, Oklahoma, and Barber County, Kansas.

Total Demand Rising

I.P.A.A. raises its sights for '55, now thinks demand will average 8,474,000 bbl., up 4.5 per cent over '54

SAN ANTONIO—Total demand for petroleum is now expected to average 8,474,000 bbl. daily in 1955, a gain over 1954 of 366,000 bbl. daily or 4.5 per cent.

The revised forecast by the Supply and Demand Committee of the Independent Petroleum Association of America was presented here at the annual meeting of the association.

This latest estimate represented an upward revision of 104,000 bbl. daily from the committee's demand forecast made last October *(The Oil and Gas Journal, November 1, page 61)*.

Total new supply for the year is now forecast at 8,515,000 bbl. daily, or 151,000 bbl. daily higher than the October forecast. The difference in the amounts by which supply and demand were increased is due to a shift in the stock picture. Total stocks now are expected to gain 44,000 bbl. daily during the year. The earlier forecast was based on a stock reduction of 3,000 bbl. daily.

Total demand in the first quarter of 1956 is projected at 9,410,000 bbl. daily for a gain of 295,000 bbl. daily or 3.2 per cent over the preliminary estimate for the first quarter of this year.

Summer gains in demand this year will be relatively larger than gains next winter. For the 6-month period, April through September, total demand is expected to be 4.3 per cent higher than in the same months last year. Winter demand, October through March, will be up 3.2 per cent.

Total demand for the first quarter of this year was estimated at 9,115,000 bbl. daily for a gain of 6.5 per cent over the same quarter in 1954. Total new supply for the quarter represented a gain of 8.8 per cent over last year. The end result was a drop in stocks of only 232,000 bbl. daily in the first quarter of 1955 compared with a reduction of 424,000 bbl. daily in the first quarter of 1954.

Seasonal spread wider . . . The committee called attention to the fact that the spread between winter and summer demand has grown so large that the difference can no longer be met through inventory changes. Some adjustments must be made in crude supply and refinery runs. Demand next winter is expected to average 1,265,000 bbl. daily more than demand during the summer months.

Required crude production for the summer period is estimated at 6,533,000 bbl. daily, based on anticipated demand, normal stock changes, and announced schedules of imports. Since April production averaged better than 6,800,000 bbl. daily, a need for a reduction of almost 400,000 bbl. daily is indicated for the remaining summer months.

The committee also called attention to changes in the elements of new supply for 1955. Imports of crude and products are scheduled to increase 12.0 per cent and 8.6 per cent respectively compared with gains of 4.5 per cent in crude production and 5.4 per cent in production of natural-gas liquids.

Since crude production was less in 1954 than in 1953, the estimate of 6,635,000 bbl. daily for 1955 represents a gain of only 2.7 per cent over the average for 1953.

Inventory levels used in the report show a gain in crude stocks from 258 million barrels at the start of the year to 275 million by the end of September. Higher refinery runs during the winter will result in a cut to 260 million barrels by the end of March 1956. Product stocks will reach 490 million barrels on September 30, dropping to 426 million by the end of next March.

Total Demand

(Thousands of barrels daily)

SUMMER SEASON

	Actual 1954	Forecast 1955	Per cent change
Gasoline	3,643	3,793	4.1
Kerosine	197	195	—1.0
Distillate	1,065	1,122	5.4
Residual	1,333	1,393	4.5
Other	1,350	1,412	4.6
Total	7,588	7,915	4.3

WINTER SEASON

	Actual 1954-55	Forecast 1955-56	Per cent change
Gasoline	3,393	3,483	2.7
Kerosine	467	480	2.8
Distillate	2,063	2,170	5.2
Residual	1,730	1,755	1.4
Other	1,239	1,292	4.3
Total	8,892	9,180	3.2

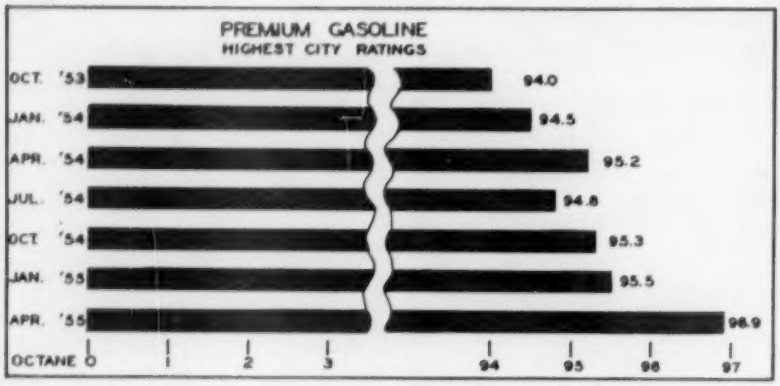
U. S. Petroleum Supply and Demand Forecast*

(Thousands of barrels daily)

	1955 First quarter	1955 Second quarter	1955 Third quarter	1955 Fourth quarter	1955 Year	Per cent change	1956 First quarter
Total demand	**9,115**	**7,925**	**7,905**	**8,950**	**8,474**	**4.5**	**9,410**
Gasoline	3,295	3,770	3,815	3,570	3,613	3.6	3,395
Kerosine	485	190	200	465	335	— 0.6	495
Distillate	2,285	1,175	1,070	1,940	1,618	7.3	2,400
Residual	1,840	1,450	1,335	1,650	1,569	4.3	1,860
Other	1,210	1,340	1,485	1,325	1,339	5.3	1,260
Exports	**315**	**325**	**300**	**290**	**308**	**—13.5**	**280**
Gasoline	80	85	85	80	83	—12.1	75
Kerosine	10	10	10	10	10	—25.4	10
Distillate	60	65	55	55	59	—11.0	50
Residual	75	70	60	60	66	—10.3	60
Other products	65	70	65	60	65	— 9.0	60
Crude	25	25	25	25	25	—32.4	25
Domestic demand	**8,800**	**7,600**	**7,605**	**8,660**	**8,166**	**5.3**	**9,130**
Stock change	**—232**	**429**	**348**	**—370**	**44**		**—500**
New supply	**8,883**	**8,354**	**8,253**	**8,580**	**8,518**	**5.4**	**8,910**
Imports	**1,330**	**1,090**	**1,060**	**1,180**	**1,165**	**10.7**	**1,310**
Crude	755	715	735	735	735	12.0	735
Products	575	375	325	445	430	8.6	575
Production	**7,553**	**7,264**	**7,193**	**7,400**	**7,353**	**4.6**	**7,600**
Crude	6,808	6,567	6,498	6,661	6,635	4.5	6,840
Natural gasoline, etc.	745	697	695	739	718	5.4	760
Runs to stills	**7,414**	**7,124**	**7,141**	**7,375**	**7,266**	**4.4**	**7,611**
Closing stocks†	**694**	**733**	**765**	**731**	**731**	**2.2**	**686**
Gasoline	185	166	149	157	157	1.0	184
Kerosine	19	29	38	28	28		18
Distillate	61	88	130	110	110	1.7	60
Residual	45	50	55	52	52		45
Other products and natural	119	127	118	114	114	0.8	119
Crude	265	273	275	270	270	4.5	260

*By the Supply and Demand Committee of I.P.A.A. †Millions of barrels.

Nation's Octane Ratings Still Climbing



Here's How the 48 Cities Compare

(Octane numbers are by research method, arithmetic averages by cities)

	PREMIUM				REGULAR			
	Octane number			TEL cont. cc./gal.	Octane number			TEL cont. cc./gal.
	Apr. 1954	Jan. 1955	Apr. 1955	Apr. 1955	Apr. 1954	Jan. 1955	Apr. 1955	Apr. 1955
Aberdeen	90.7	92.3	91.3	2.14	83.7	84.6	84.8	1.67
Amarillo	90.0	91.6	93.0	2.16	82.4	83.8	84.4	1.62
Atlanta	94.5	95.0	95.8	2.18	86.2	87.0	87.5	2.36
Bakersfield	90.7	92.4	93.2	2.88	82.4	83.4	83.8	1.77
Baltimore	94.5	95.5	96.6	2.64	88.4	90.0	90.0	1.97
Boston	94.1	95.3	96.1	2.20	88.4	89.9	90.4	2.17
Calgary	88.3	89.0	89.9	2.86	83.0	83.4	83.1	2.24
Casper	90.1	90.0	90.4	1.62	82.7	84.1	83.7	1.17
Charlotte	93.9	95.1	96.0	2.25	86.1	87.0	88.5	2.40
Chicago	92.0	92.4	93.9	2.53	84.6	84.7	85.6	1.95
Cincinnati	92.8	93.9	94.7	2.65	87.7	88.2	89.0	2.31
Cleveland	93.2	94.2	94.7	2.30	88.2	89.7	89.2	1.79
Columbus	93.0	94.2	94.3	2.43	87.6	89.3	89.2	1.83
Corpus Christi	94.1	94.4	96.5	2.73	86.3	86.4	86.7	2.07
Dallas—Fort Worth	94.5	95.1	96.4	2.41	85.7	86.2	86.5	2.37
Denver	89.8	90.5	90.4	1.53	82.1	83.6	84.1	1.34
Detroit	93.3	94.3	94.6	2.13	87.8	88.7	88.8	1.95
Edmonton	90.0	89.8	90.1	1.95	83.8	83.5	83.8	1.65
El Paso	91.2	93.1	92.7	1.74	82.7	82.2	82.3	1.48
Great Falls—Billings	91.5	92.9	93.2	2.19	84.0	85.3	86.3	1.68
Houston	94.9	94.9	96.9	2.72	86.8	86.7	87.1	2.55
Indianapolis	91.3	93.6	93.9	2.30	84.1	85.1	85.7	1.84
Jacksonville	94.2	95.3	96.0	2.30	86.6	89.6	89.6	2.34
Kansas City	91.6	91.8	92.8	2.35	83.6	84.7	84.5	1.95
Little Rock	95.2	94.6	96.3	2.76	86.5	86.3	87.5	2.52
Los Angeles	91.9	93.9	94.7	2.47	83.2	83.7	84.8	1.66
Louisville	93.6	94.2	95.4	2.75	85.8	86.9	87.7	2.60
Memphis	94.2	94.7	95.7	2.71	85.4	87.5	87.5	2.34
Milwaukee	93.7	94.4	94.8	2.44	84.3	85.4	85.6	1.78
Minneapolis	91.4	92.4	92.5	2.09	84.1	84.7	85.0	1.73
Montreal	92.4	92.5	92.7	1.85	86.8	87.7	89.1	1.05
Nashville	94.3	95.4	96.0	2.61	85.9	87.7	88.0	2.37
New Orleans	94.4	94.8	96.3	2.81	86.3	86.7	87.7	2.63
New York	93.9	94.7	96.1	2.39	88.2	89.9	89.8	2.24
Omaha	90.9	91.7	92.2	2.35	83.4	84.9	85.0	2.04
Philadelphia	94.2	95.1	96.5	2.08	88.2	90.3	90.2	2.24
Pittsburgh	94.3	95.1	96.0	2.32	88.3	90.1	89.7	2.47
St. Louis	91.6	92.2	93.6	2.42	83.8	84.9	85.9	2.12
Salt Lake City	89.0	90.3	90.1	1.33	81.6	81.8	81.6	1.72
San Francisco	91.9	94.2	94.5	2.20	83.1	84.3	85.0	1.20
Seattle	92.0	93.8	94.2	2.49	83.6	84.3	85.5	1.54
Shreveport	94.6	94.6	95.9	2.66	86.0	86.9	87.5	2.54
Spokane	91.5	93.7	94.0	2.04	83.2	84.6	84.4	1.30
Toronto	92.1	92.9	93.8	2.08	86.7	87.7	88.4	1.32
Tulsa-Oklahoma City	92.0	92.1	93.0	2.48	83.3	84.6	85.6	2.07
Vancouver	91.0	92.7	92.7	2.51	84.4	84.1	84.6	1.92
Wichita	90.3	91.2	92.1	2.18	83.1	84.3	84.6	1.94
Winnipeg	91.3	92.6	92.1	1.03	84.9	85.8	86.0	1.09

WILMINGTON, Del.—Premium gasoline moved up about 0.8 of an octane number and regular gasoline gained 0.4 in the first quarter of the year.

The unweighted average for premium in 48 typical cities of this country and Canada was 94.1 octane on April 1 compared with 93.3 at the first of January and with 92.4 a year ago. The average for April 1953 was 90.2. These averages are from data compiled quarterly by the chemicals division of E. I. du Pont de Nemours & Co., Inc.

In the April survey, 13 cities had premium gasoline averaging above 96 octane. Houston was top city with an average of 96.9 with samples from two stations in that city testing above 98 octane.

The trend toward higher octane premium gasoline is shown by the fact that 17 cities had premium averaging better than 95 octane on the latest survey compared with only one city a year ago.

Use of tetraethyl lead has changed very little in the past 2 years. The unweighted average from the April 1953 survey was 2.20 cc. per gallon compared with 2.30 on the latest survey.

The octane advance by regular gas-

GENERAL COMPARISONS*

	Apr. 1953	Apr. 1954	Jan. 1955	Apr. 1955
Premium—				
Research Oct. No.	90.9	92.4	93.3	94.1
TEL conteat (cc. per gal.	2.20	2.27	2.12	2.30
Regular—				
Research Oct. No.	84.4	85.0	86.1	86.5
TEL content (cc. per gal.)	1.85	1.94	1.78	1.94

*Unweighted averages of 48 cities.

Ethyl Reports 95.2 Average

NEW YORK.—Ethyl Corp.'s second published survey of octane ratings last week showed a nationwide weighted average of 95.2 for premium and 87.7 for regular gasoline.

The Ethyl survey shows a higher average than the Du Pont study, since it considers gallonage sold in each of the cities surveyed. In an unweighted average, Rocky Mountain centers, where octane rating is low, are given the same weight as the large eastern cities, which in general have ratings among the highest.

The Ethyl survey showed an average lead content of 2.52 ml. per gallon for premium and 2.12 for regular.

oline has been at a slightly slower pace than for premium. The unweighted average for the 48 cities on the latest survey was 86.5 octane, up 2.1 octane numbers in the past 2 years. Premium gained 3.2 octane numbers for the same period.

Regular gasoline for three cities, Baltimore, Boston, and Philadelphia, averaged better than 90 octane on the April survey. Boston was top with 90.4. Salt Lake City was low with 81.6.

On the April survey, 6 cities had regular gasoline averaging under 84 octane, 17 cities ranging between 84 and 85.9, and 11 between 86 and 87.9. A total of 14 cities tested 88 octane or better.

U.S. Producing Capacity Rising

SAN ANTONIO.—The nation's crude oil producing capacity increased 516,000 bbl. daily in 1954 for a 6.5 per cent growth over the year before. A 473,000-bbl. daily increase is expected this year.

That was the report made by the productive capacity committee of the I.P.A.A. at the group's meeting here.

The committee reported that combined producing capacity of crude-oil and natural-gas liquids increased by 550,000 bbl. daily last year and should go up another 500,000 bbl. this year.

The productive capacity at the end of the year was 8,442,000 bbl. daily of crude oil, 778,000 bbl. daily of natural-gas liquids for a total of 9,220,000 bbl. Estimated capacity for this year was put at 8,915,000 bbl. daily crude, 805,000 bbl. natural-gas liquids for a 9,720,000-bbl. total.

The report noted that the average daily production capacity for 1954 was 8,184,000 bbl. of crude and 761,000 bbl. of natural-gas liquids for a total average production of 8,945,000 bbl. Actual production was only 6,346,000 bbl. daily crude, 681,000 bbl. daily natural-gas liquids for a total of 7,027,000 bbl.

As a result, the nation's unused capacity during the year was 1,838,000 bbl. daily crude, 80,000 bbl. daily natural-gas liquids for a total of 1,918,000 bbl.

Factors contributing to this unused capacity were a slackening in growth of U. S. oil consumption, continuing increase in producing capacity, decrease in actual production from previous year, and imports of crude and refined products.

U. S. PRODUCTIVE CAPACITY
(All figures in thousands of barrels daily)

	As of Jan. 1953†	As of Jan. 1954‡	As of Jan. 1955‡
Crude oil:			
Dist. 1	49	48	40
Dist. 2	1,238	1,325	1,473
Dist. 3	4,686	4,952	5,282
Dist. 4	394	466	547
Dist. 5*	1,098	1,135	1,100
Total U. S.	7,465	7,926	8,442
Natural-gas liquids:			
Dist. 1	19	22	12
Dist. 2	98	115	130
Dist. 3	481	504	526
Dist. 4	9	10	12
Dist. 5*	87	95	98
Total U. S.	694	744	778
Total petroleum liquids:			
Dist. 1	68	70	52
Dist. 2	1,336	1,440	1,603
Dist. 3	5,167	5,454	5,808
Dist. 4	403	476	559
Dist. 5*	1,185	1,230	1,198
Total U. S.	8,159	8,670	9,220

*Includes Elk Hills Naval Petroleum Reserve. †Estimated by the National Petroleum Council. ‡Estimated by the Independent Petroleum Association of America.

Importers' Net Up

Domestic firms generally made less money in 1954

TULSA.—The five principal importing companies account for all of the increase in 1954 earnings over 1953 of 54 major and semimajor oil companies whose annual statements for last year are now available.

Earnings of domestic companies as a group were down. The data are based on a report prepared by Carl H. Pforzheimer & Co., New York.

The net income of the five international companies — Standard Oil Co. (N. J.), Standard Oil Co. of California, Socony-Vacuum Oil Co., Inc., Gulf Oil Corp., and The Texas Co. — jumped from $1,325,347,553 in 1953 to $1,389,425,406 in 1954, a gain of $64,077,853 or 4.8 per cent.

For the entire 54 companies, which includes the five international companies, net income increased from $2,815,983,971 in 1953 to $2,840,567,594 in 1954, a gain of $24,583,623 or 0.8 per cent.

The list of 54 companies includes three major affiliates of Standard Oil Co. (N. J.). These are Humble Oil & Refining Co., Creole Petroleum Corp., and Imperial Oil, Ltd. Dropping these three companies and the five international companies, the report covers the operations of 46 large companies whose operations are either exclusively or predominantly domestic.

Domestic earnings down . . . For the 46 domestic companies, net earnings decreased from $1,049,397,043 in 1953 to $1,015,606,154 in 1954, a reduction of $33,790,889 or 3.2 per cent.

Reflecting the size of the international companies' operations, the net income of the five companies in 1954 of $1,389,425,406 was 36.8 per cent greater than the $1,015,606,154 net income of the 46 companies.

The gross income of the five companies in 1954 totaled $11,743,130,907 in 1954, which is $253,302,944 or 2.2 per cent greater than the gross income of the 46 companies.

The total assets of the five companies aggregated $14,463,843,188 at the close of 1954 which was $1,132,662,120 or 8.4 per cent greater than the gross of the 46 companies.

Gross assets . . . For the entire 54 companies, gross assets at the close of 1954 totaled $30,600,154,049, an increase of $2,104,681,350 or 9.8 per cent over the $28,495,472,214 figure at the close of 1953.

Other 1954 and 1953 comparisons

First-Quarter Earnings Much Better Than '54

TULSA.—The first reports on earnings for the first quarter of this year point to substantial gains over the same quarter of 1954 among companies whose operations cover all divisions of the petroleum industry. The 1955 first-quarter gain for five representative major companies averaged 12.5 per cent. Improvement in wholesale and refinery product prices in some areas and increases in crude-oil production and refinery operations were factors in the gains in earnings so far this year over the same period last year. The following table summarizes first-quarter earnings' statements released last week.

	1955		1954		1955 Gain
	Total	Per share	Total	Per share	(per cent)
Gulf Oil Corp.	$45,320,000	$1.77	$39,790,000	$1.56	14.0
The Texas Co.	56,021,212	2.04	50,848,438	1.85	10.1
Phillips Petroleum Co.	22,110,258	1.50	19,162,400	1.31	15.0
Cities Service Oil Co.	14,074,633	1.42	12,041,417	1.21	16.8
Skelly Oil Co.	7,698,141	1.33	7,165,481	1.24	7.4
Total	$145,224,244		$129,007,736		12.5

for the 54 companies are: net property account, (1954) $18,602,003,103 and (1953) $16,883,232,475; net working capital, (1954), $6,205,321,258 and (1953), $6,024,030,098; senior obligations, (1954) $3,916,986,111 and (1953) $3,852,149,897; common stock and surplus, (1954) $21,515,778,104 and (1953), $19,477,932,386.

Profits Misleading

Replacement costs aren't reflected, I.P.A.A. warned

SAN ANTONIO.—A warning has been sounded that glowing reports of oil-company profits do not reflect true economic conditions in the industry.

Present high costs of finding, developing, and producing crude petroleum and natural gas are not adequately accounted for. Traditional accounting concepts use historical costs as the basis for charges against income rather than the much greater replacement costs prevailing today.

If these higher replacement costs are not charged against income, reported profits are overstated, the cost study committee of the I.P.A.A. reported to the group's meeting here.

The committee warned that because of traditional accounting practices, the increasing cost of finding and developing oil to replace that now being produced will not be reflected in the income statements of oil producers for several years to come.

The industry was urged to force greater recognition of accounting for replacement costs.

Startling data presented by the committee revealed that in the last 3 years 70 per cent of the oil produced in the United States came from fields found prior to World War II when costs were far below those of today. More than 30 per cent of 1954 production came from fields discovered since the war.

The committee noted that all cost factors were up:

... **Wages and salaries** climbed 2.6 times, from 87 cents per hour in 1937-41 to $2.27 per hour in 1954.

... **Steel prices** were up 1.7 times, from 2.7 cents to 4.7 cents in the same period.

... **Footage drilled** increased twice. It took 66 ft. of hole for every 1,000 bbl. of new reserves found compared with only 35 ft. in 5 prewar years. Dry holes averaged 37.8 per cent compared to 22 per cent before. The average depth of all wells was 32 per cent greater.

The committee said all these specific factors resulted in a 4.5 times greater cost for finding and developing crude oil. For this additional expenditure the industry found and developed only 1.3 times as much oil as it did prewar.

For instance, oil men in 1937-41 located 31 bbl. of new oil for each foot drilled, but in 1954 they found only 15 bbl. per foot drilled. The result is oil men must spend 60 per cent of their gross income from sale of crude to stay in business by searching for and developing new supplies.

Needed: 990 billion barrels . . .

New Reserves Key to Survival

CLEVELAND.—The oil industry will have a tough struggle in the next 50 years keeping its dominant position in the world energy picture, B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., says.

Jennings sees these developments:

... **Oil men will have difficulties** supplying their share of world energy demands in the next 25 years.

... **Domestic producers will face** the same problem and—believe it or not—may eventually welcome crude imports to supplement supplies in the United States.

... **Atomic energy will become** a major factor by 2000 A.D. but by then uses of oil will be concentrated in areas where it has special advantages.

Jennings told the Cleveland Society of Security Analysts that economists estimate total world energy demand will double in the next 25 years and double again by the end of the century. The world demand for oil, he estimated, would increase 6.2 times requiring about 87 million barrels daily to supply.

Find more oil . . . The industry, under this demand pressure, will have to find some 990 billion barrels of oil in this period.

Allowing for continued increases in efficiency of utilization of oil products, demand for oil by the end of the century still will be somewhere around 40 to 45 million barrels daily. This would require cumulative production of 415 billion barrels in the remainder of this century, or 1.7 times the total of all oil discovered to date.

This need highlights a basic problem, however. Most of shallow, least expensive oil in this country apparently has long since been found and the search for oil goes deeper and becomes costlier each year.

Jennings also pointed out that the ratio of U.S. oil reserves to annual domestic production already has started down, that it is harder to find new oil reserves, the rate of discovering new fields is discouraging, and fields being found are smaller.

"There is no doubt in my mind," Jennings affirmed, "that there is a lot more oil to be found in this country and that oil men will find more." He said shale deposits and tar sands might be developed under more favorable economic conditions. But he warned that unless present trends are reversed, possibly by some new oil-finding tools or techniques, domestic producers may find it impossible to meet U.S. future oil requirements at a price the economy can pay.

Selective use . . . Jennings declared "in the long run anyway, we are going to need increasing supplies of foreign oil to supplement our domestic supplies."

The Socony-Vacuum president estimated that by 2000 A.D. atomic energy will be supplying about one-fourth of the world's energy demand. He said atomic energy seems likely to find greatest use in generating electricity, home use, and as fuel for railroads, reducing the demand for residual-fuel oil, heating oil, and diesel fuel.

Uses of oil will become more selective by then, he said, concentrating in fields where it has special advantages. Chief among these uses would appear to be as automotive fuel, lubricants, asphalts and petrochemicals.

T.G.T. to Expand System

HOUSTON.—Tennessee Gas Transmission Co. has proposed to the Federal Power Commission that it spend $56 million in new pipeline and compressor facilities, including extending its gas gathering system into southeast Louisiana and Mississippi River delta areas which now have insufficient market outlets.

The construction would increase capacity of the company's transmission system to 1,800,000 M.c.f. daily and to 2,180,000 M.c.f. on peak days.

The work would include 221 miles of 30-in. and 26-in. loops in Kentucky and Ohio and approximately 376 miles of gathering lines in Louisiana and Texas. Some 12,540 hp. would be added at new and existing compressor stations in Louisiana, Mississippi, and New York.

Important new gas reserves to be made available by extension of the gathering system will support the additional sales.

What Price Radio?

"Below cost" offer for service in California provokes hot debate before annual convention of P.I.E.A., P.E.S.A.

Robert G. Deering

HOUSTON. — Can you get mobile radio services below cost? This question was the basis of a heated debate at the meeting here of the Petroleum Industry Electrical Association and the Petroleum Electric Supply Association.

Joseph E. Keller, Washington counsel for P.I.E.A., said a recent California case shows that American Telephone & Telegraph Co. is offering mobile radio services at less than cost. On the surface this seems like a good deal. But the implications are that A.T.&T.'s losses would be made up by rate hikes to general telephone users.

Keller's analysis brought a quick denial from Justin J. Murphy, A.T.&T. representative. He said Keller's report was misleading, inaccurate, and biased.

Communication men in the oil industry have long contended that A.T.&T. can offer cheap lease-maintenance arrangements because it makes up the difference with money from common-carrier service. The Federal Communications Commission is investigating this now.

The case Keller referred to is an application by Southern California Gas Co. and Southern Counties Gas Co. of California to sell their mobile radio systems to Pacific Telephone & Telegraph Co., a subsidiary of A.T.&T. The systems would then be leased to the two companies. P.T.&T. would maintain them.

The case could set a precedent for future lease-maintenance contracts.

Why it's significant . . . Oil industry communications men are worried about the development for one reason:

They believe that below-cost service would eventually be ruled out by regulatory bodies all over the country. They feel certain the public utilities would be required to raise their rates. But, they're afraid these developments might come only after many company-owned installations had been sold to the public utilities.

The original application to the Public Utilities Commission of California called for a sale price of $358,000. Yearly lease charge would be $114,000. In an interim opinion, the California commission turned down the application. Its grounds were that P.T.&T. would not make a fair rate of return on the transaction and that it might place the loss burden on regular telephone users. The commission ruled that P.T.&T. would have to get at least $126,000 yearly rental to make 7 per cent return.

Murphy said since the interim opinion of the California commission the interested parties had agreed on the higher lease charges. In fact, he said, the gas companies were happy to agree. Their communication costs would still be lower than if they owned the systems outright. In the latter, the California commission agreed. Even at the higher figure, the gas companies should still be justified in making the deal.

Microwave rules to come . . . Before getting into the lease-maintenance argument, Keller told of important developments to watch for in the near future.

It appears, he said, that a definite set of rules for microwave will soon be made by the FCC. This will take microwave out of the development status. Under the present setup, microwave users could conceivably be forced to change their methods of operation, or even shut down operation if the FCC decided to make drastic changes.

Split-channel operation is also due to get full FCC approval, he said. This is probably the greatest step ever taken by the commission to make more frequencies available in the petroleum industry band. At present, center frequencies in the 25 to 50 megacycle band are separated by 40 kilocycles. New rules will reduce this spacing to 20 kilocycles and double the number of frequencies available.

In the 152-160 megacycle band, the commission will probably set up 15 kilocycle spacing with stations in the same geographic area spaced at least 30 kilocycles apart. This, too, will relieve a crowded situation, he said.

Drilling Safety Clinic Set

DALLAS.—One of the top attractions of the tenth annual Drilling Industry Safety Clinic here this week, May 5 and 6, will be a working-level panel discussion set for the afternoon of May 5.

Panel members will include three tool pushers, three drillers, and two safety directors. These are the men with the direct responsibility for safe drilling operations. The clinic's sponsoring society, the American Association of Oilwell Drilling Contractors, is convinced they will have fresh and valuable ideas on the subject.

About a dozen papers are scheduled on the program during the 2 days.

Industry Briefs

OKLAHOMA CITY.—The Oklahoma Corporation Commission has ordered a cut in the state's oil allowable for May, from 565,000 bbl. to 540,000 bbl. daily. The reduction was recommended by Massena Murray, conservation director. The reduction was made with the hopes of stopping pipeline proration and reestablishing equity between fields and wells.

DENVER.—Liberty Oil & Uranium Co., Denver, has acquired 686 acres and 19 producing oil wells in Callahan County, West Texas. Sellers included film star James Stewart, and two Texas oil men—F. Kirk Johnson and L. A. Warren. Purchase price was reported about $500,000.

BATON ROUGE.—Louisiana's daily production allowable for May has been increased 13,339 bbl. over April to take care of new production. The May allowable was set at 708,671 bbl. daily.

WASHINGTON. — The American Petroleum Institute is publishing a third edition of the "Tentative Standards for Field Welding of Pipe Lines." It incorporates certain changes resulting from comments on the second edition issued last year.

NEW YORK.—Socony-Vacuum Oil Co. is marketing a new cylinder oil designed for economical operation of marine diesel engines. It is called Gargoyle D.T.E. Marine Oil S-250 and has a Series 2 detergency level and an SAE 50 viscosity.

KANSAS CITY.—Great Lakes Pipe Line Co. has started transporting to its Chicago terminal gasoline of 95 and 89-octane grades. The carrier will continue to transport 94 and 86-octane gasolines to its other terminals.

SANTA FE, N. M.—The New Mexico Oil Conservation Commission has cut the state's oil-production allowable for May to 262,887 bbl. daily. The April allowable was 264,836 bbl. daily. The basic unit allowable was cut to 39 bbl. from the 41 set for April.

Deadlines Extended

Trans-Canada given until October 31 to finance line; new schedule calls for work to start by June 30, 1956

CALGARY. — Trans-Canada Pipe Lines, Ltd., gained a new vote of confidence last week.

The Alberta Petroleum and Natural Gas Conservation Board extended the company's permits to finance construction of a line to eastern Canada and to export natural gas from the province.

The board's action left just one hurdle in the matter of extensions. That is their approval by the Federal Board of Transport Commissioners in Ottawa. This approval was expected to be granted at once.

Trans-Canada, as result of the Alberta board's sanction, has a virtual monopoly on gas to be exported from the province to eastern Canada. No other company has or is likely to get access to the supply. If Alberta gas is to serve eastern Canada reasonably soon, none other than Trans-Canada is in a position to supply it.

New terms . . . Under the extensions, Trans-Canada has until October 31 to complete arrangements for financing of the 2,200-mile line. The earlier deadline was April 30.

Deadline for starting construction was extended 13 months, from June 1, 1955, to June 30, 1956. Also, a 1-year extension, from December 31, 1955, to December 31, 1956, was granted for removal of gas from the province.

Company officials are confident that these extensions are adequate to make the pipeline dream a reality.

Extensions of the deadlines were sought several weeks ago when the company failed in a move to have the federal government assist in financing of the big project.

Engineering progress . . . In its first official progress report, Trans-Canada announced that practically all of the engineering work for the western section of the line has been completed. This section will extend from Alberta to Winnipeg and south to Emerson, Man.

Maps for submission to the Board of Transport Commissioners for this section are 95 per cent completed. All necessary permit drawings have been finished and 75 per cent of the construction permits received. About 85 per cent of the right-of-way options have been acquired. General layout plans for gas-consumption facilities for the first year's requirements are completed, and detailed drawings are well advanced.

On the central section, between Winnipeg and Toronto, 75 per cent of the line location is ready for mapping.

On the eastern section, from Toronto to Montreal, final maps for the Board of Transport Commissioners are 77 per cent completed. Permit drawings are 75 per cent completed, and 65 per cent of right-of-way options have been obtained.

Materials . . . Details for transportation and customs clearance for construction materials have been arranged for both western and eastern sections. Material and equipment specifications for lines and station are virtually complete.

Bechtel-Mannix-Hester, the company named to supervise design, engineering, and management of construction, has completed a survey of manufacturing facilities and source of supply for pipe valves and equipment in Britain and on the European continent. Letters of intent have been issued and accepted by three U.S. mills and one in the United Kingdom for supply of 257,000 tons of pipe.

Letters of intent also have been sent to successful bidders for compressor and valve requirements.

Contracts . . . Officials announced a large sales contract is pending with Consumers Gas Co., Toronto. Negotiations also are proceeding for sale of gas in Regina, Winnipeg, Ottawa, Montreal, and several smaller centers along the route.

In addition, sales contracts have been made with Northern Natural Gas Co., Omaha, and Union Gas Co. of Canada.

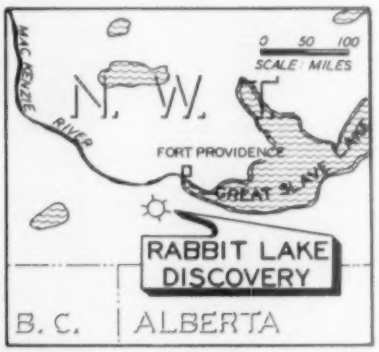
Contracts have been arranged with seven Alberta producers for purchase of 25 per cent of the gas requirements for full capacity of the line.

Firm Buys Canadian Rights

DALLAS.—General American Oils, Ltd., a subsidiary of General American Oil Co. of Texas, Dallas, has purchased rights to 1,011,000 acres of permit lands in northeastern British Columbia from British Columbia Oil Lands, Ltd.

British Columbia Oil Lands received $220,000 in cash and a 25 per cent interest in any production developed. A General American spokesman said the firm plans to spend up to $500,000 to explore the acreage this year.

All of the permit lands are between White-Blueberry pool in British Columbia and a recent gas discovery by J. B. White & Associates in the Northwest Territory. The well was rated at 13,000,000 cu. ft. daily.



Gas Field Opened

First good flow reported in Northwest Territories

FORT PROVIDENCE, N. W. T.—First substantial gas flow in Canada's Northwest Territories has been reported at a rank wildcat 50 miles southwest of here.

Sources in Calgary reported the wildcat rated a calculated open-flow potential of about 17,000 M.c.f. per day. The open flow test was run over a 20-25-ft. interval at about 2,600 ft. with gas coming from a Devonian lime above granite.

The well, Briggs 1 Rabbit Lake, is about 65 miles north of the Alberta border. It was drilled by J. B. White and A. M. Lloyd and associates on farmout lands acquired under agreement with Canadian Prospects, Ltd., and R. Campbell.

An offset has been started 1¾ miles southwest of the discovery. An Ozark Drilling Co., Ltd., rig was moved from the discovery to drill the offset.

The discovery was staked only after an extensive seismic, surface-geology, and core-hole program. The drilling group has about 3 million acres of permit rights in this Northwest Territories acreage. The White-Lloyd group owns 64 per cent and the remaining 36 per cent is split evenly between Canadian Prospect and R. Campbell.

Gas Outlet Sought

Trans-Canada officials bargaining for utility

MONTREAL. — Some principals of Trans-Canada Pipe Lines, Ltd., are working on a deal to buy the gas-manufacturing and sales division of Quebec Hydro-Electric Co.

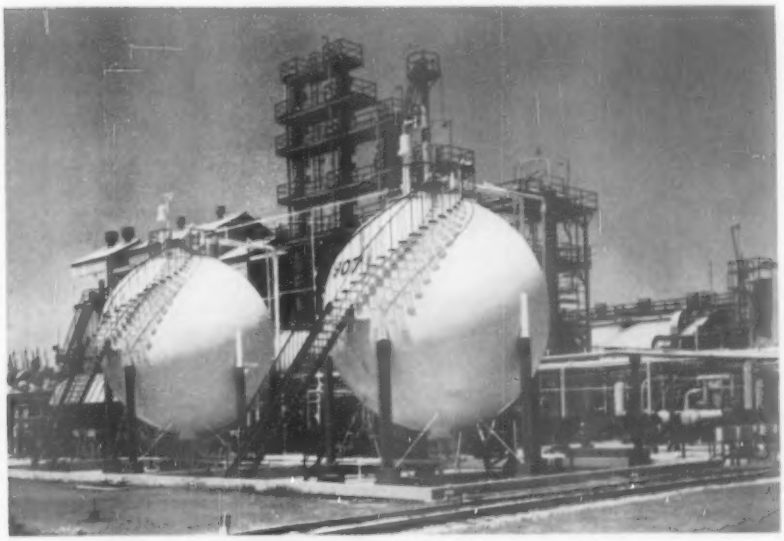
Premier Maurice Duplessis of Quebec said the group had outlined to him a $30,000,000 plan to buy and convert the system to natural gas. The Montreal project would have no direct association with Trans-Canada, but would buy Trans-Canada gas.

Reliable sources said the deal is definite and should be completed soon. Individuals involved are not expected to be identified until the sale is final.

Quebec Hydro-Electric is primarily an electric utility and is reported to favor getting rid of its manufactured-gas distributing business.

It is believed that the plan of the purchasers is to serve Montreal through the system with gas imported from the United States through the Montreal extension of Trans-Canada's Toronto-Niagara section when it is completed. When Trans-Canada's line is completed from Alberta to Toronto, Alberta gas would replace that imported from the United States.

GULF COAST



BUTYL-RUBBER PLANT at Baton Rouge returned to Esso Standard.

Rubber Plants Change Hands

BATON ROUGE.—The Government last week started bowing out of the synthetic-rubber business when it transferred to private ownership the first three of 24 war-time plants sold recently.

The actual transfer climaxed months of dickering with industry during which a Government commission got nearly $20 million more than was first offered for the facilities.

First plant to be shifted to private hands was the 47,000-ton butyl rubber unit here acquired by Esso Standard Oil Co. Esso, a pioneer in synthetic rubber, formally regained control of the butyl plant it built in 1937 after its own scientists had patented the process for making the petroleum-base rubber.

The Government took over all synthetic-rubber plants during the war and Esso operated its unit on contract. The company paid $14,857,000 to reacquire the facilities.

Esso Standard has a marketing job ahead for output of the butyl plant here. Butyl rubber got its start in inner tubes. With the inner-tube business giving way to tubeless tires, Esso is seeking additional uses of butyl, including an all-butyl tire which the company now is working on.

In other transfers, title to copolymer and butadiene plants here went to Copolymer Corp., the firm which operated them for the Government since 1943. Copolymer paid $5,000,000 each for the two plants.

Offshore Leasing

Texas wary of Government, but going ahead with plans

AUSTIN. — Texas will offer about 186,000 acres in the Gulf of Mexico for leasing May 3, but she's still keeping a wary eye on the federal Government.

Confirmation of the leasing plans came after speculation that the Government was about to step in and dispute Texas' right to lease lands outside the 3-mile limit. Texas claims the land out to 3 leagues, or 10.35 miles.

Atty. Gen. John Ben Shepperd, after a trip to Washington, expressed the fear that the Government might interfere. But, Sen. Price Daniel of Texas assured state officials that the leasing would not be contested. Daniel said he based his idea on conferences with officials of both the Interior and Justice Departments.

J. Earl Rudder, Texas land commissioner, said another 123,000 acres in Texas bays and 37,000 acres on land will be included in the sale.

In a previous offshore lease sale in 1953, Texas collected $32,000,000 and there was no protest from the Government, but recent agitation on the part of Louisiana for the same 3-league —instead of only 3-mile—offshore limit has apparently clouded the official water on just what Washington might attempt to do.

Texaco Is Top Bidder

BATON ROUGE — The Texas Co. topped the bidding in Louisiana's latest sale of oil and gas leases with a bid of $3,550,000, plus one-sixth royalty, for 2,250 acres in the Timbalier Bay area southeast of the Caillou Island Dome off Terrebonne Parish.

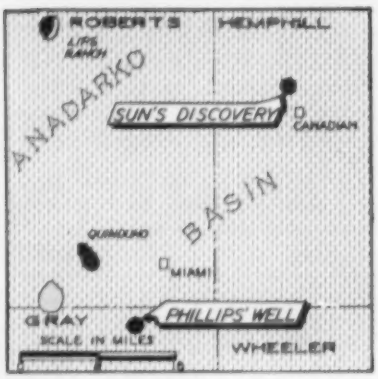
Other large bids included $1,112,000, plus one-sixth royalty, for 3,443 acres in Lake Salvador off St. Charles Parish submitted by the California Co. Continental Oil Co. leased 1,523 acres in the southwest quarter of Main Pass, Block 31, for $1,540,056, plus one-eighth royalty.

Shell to Add Platformer

HOUSTON.—Shell Oil Co. will add a new 16,000-bbl. daily Platformer at its Houston refinery.

John Tench, refinery manager, said last week Procon, Inc., will start work immediately on the new unit. It is expected to be completed early in 1956.

A new Hydrodesulfurization unit of the same capacity will be built at the same time.



Key Strikes Made

Two pre-Permian tests hold Texas Panhandle spotlight

AMARILLO.—Two significant pre-Permian discoveries have been made in the Texas Panhandle.

Sun Oil Co. gave Hemphill County its first production with a wildcat 2½ miles northwest of Canadian. A Phillips Petroleum Co. well in adjoining Gray County may have turned up the third pay zone in Laketon-Delp field.

Sun's discovery well, 1 Dale Nix, made a calculated potential flow of 149.76 bbl. of 50.8°-gravity oil daily. The potential is based on a flow of 16.67 bbl. in 2 hours followed by 11.41 bbl. in 2½ hours. Flow was through a ¼-in. choke from perforations at 9,615-9,794 ft. Production is from the Cherokee sand (Des Moines-Pennsylvanian). The hole was bottomed at 12,714 ft.

Sun will drill a 10,000-ft. test 2 miles northwest of the discovery. Nearest production is at Lips Ranch Morrow field 23 miles to the southeast in Roberts County.

The Phillips well, 2 Delp, indicated production on a test of the Pennsylvanian granite wash at 7,732-42 ft. Volume of gas was rated at 11,300,000 cu. ft. per day. By the end of the test, flow was gaged at 12,600,000 cu. ft. per day plus 2 bbl. of distillate.

The 2 Delp is a ½-mile outpost of the pre-Permian discovery well, 1 Delp. The producing zone is higher than at the discovery well, but it is possible it is the same granite wash pay that was raised due to faulting. This section of the Panhandle lies off the Amarillo Uplift where structure is confusing. The only other nearby production is the Laketon-Delp field discovery well, 1 Troy "A," which produces from the Ellenburger.

Texas A. & M. Has Producer

CONROE, Tex.—Texas A. & M. College late in April saw the first producing well completed on acreage it owns.

The well, a large gas-distillate producer, was completed near here by Sinclair Oil & Gas Co. It was the first strike on roughly 40,000 acres the college has leased for oil and gas development in various portions of Texas.

The college, under a 1932 agreement with the University of Texas, has received one-third of the royalties from production on Texas University lands. It will receive the full royalty from production on its own lands. All leases on these lands provide for one-sixth royalty.

Sinclair's Montgomery County wildcat is producing from 5,460 ft. in the Cockfield sand. The 3,500-acre block on which it was drilled includes 1,417 acres of forestry lands leased to the company by the college.

Texas Tax Bill Approved

AUSTIN.—The Texas House of Representatives has passed and sent to the senate an omnibus tax bill which halts a scheduled drop in the gas production tax and imposes an extra cent a gallon levy on gasoline sales.

The action drew a blast from Texas Independent Producers and Royalty Owners Association. A. P. King, Houston, TIPRO president, said it violated a pledge not to ask the natural-gas industry to carry indefinitely a seriously disproportionate tax burden. *(The Oil and Gas Journal, April 25, page 98.)*

In other action, the house dealt probably a death blow to a proposed economic-waste bill by refusing to consider it out of order.

Depth Record Broken Twice

HOBBS, N. M.—New Mexico's producing depth record fell twice last week.

Early in the week, Cities Service Co. set a new record when it completed 1 State "AP" in Caudill field in the Devonian at 13,542-13,657 ft. But this record was short lived.

Continental Oil Co. topped the new record with its 1-A Bell Lake Unit. Final tests were between 14,940-15,025 ft. In addition, this well equals the producing depth of Texas, where the Puckett gas field produces from the Ellenburger at around 15,000 ft.

Continental's well went to a total depth of 15,120 ft. Its initial production, through open tubing, was 15,500 M.c.f. of gas, from Devonian perforations at 14,940-15,025 ft. A previous test through ½-in. choke gaged over 6,000 M.c.f. under 1,400 psi.

The Cities Service well is the largest completed in Caudill field, 6 miles north of Lovington. Potential was 1,125 bbl. of oil a day from open hole in the Devonian at 13,542-13,657 ft. Gravity was 61° and choke size was ¾-in.

Before last week's two wells, Buffalo Oil Co.'s 12-B Baish in Lea County was the state's deepest producer. It produced from 13,573 ft.

Gasser Completed

Phillips gets good flow in Texas' Val Verde County

SONORA, Tex.—Val Verde County, in far-southwestern Texas, last week claimed its second field discovery.

In the northeastern corner of the county, Phillips Petroleum Co.'s 1-A Cauthorn had an open flow of 42,000,000 cu. ft. of gas per day. Condensate recovery was at the ratio of 1 bbl. per million cubic feet.

The well is in the Vinegarone area, 5 miles southwest of gas production.

Tested through ⅜-in. choke, it flowed at the rate of 12,292,000 cu. ft. per day with pressure of 3,557 psi. On ⅛-in. choke, the smallest choke through which it was tested, its flow was at the rate of 3,615,000 cu. ft. per day with 4,568 psi.

Shut-in pressure is 5,019 psi.

Production is from the Pennsylvanian-Strawn lime with casing perforations at 9,982-10,052 ft. and 10,174-10,262 ft. This is the same horizon, and at about the same depth, from which the original Vinegarone gas area produced.

Discovery well in the original Vinegarone area, the first commercial production in the county, was drilled by R. J. Caraway. It was completed in May 1951 as a 35,000,000-cu ft. gasser in Strawn lime at 10,050-10,100 ft. Connection was made to El Paso Natural Gas Co.'s system, but there has been no production since 1953.

The area is the scene of another deep test being drilled by Humble Oil & Refining Co. about 1 mile south of Phillips' discovery well. Now drilling around 1,000 ft., it is scheduled to be carried to 13,000 ft.

Geologically, the area is on the west flank of the Edwards Plateau, in the southeastern portion of the Val Verde basin.

Imports Showdown Due This Week

- **Finance committee ignores Neely amendment, would put responsibility for safe level of imports on Eisenhower**

- **Neely says he will make another drive for quotas this week on the Senate floor; little chance for success seen**

Bertram F. Linz

WASHINGTON.—The fight over limitation of oil imports will climax in the Senate this week.

The Senate will decide whether to put an immediate quota on imports or leave it to the President to act if he finds foreign oil threatens national defense. Or it could decide to make no change whatever in the Reciprocal Trade Act, but is seen unlikely to take that course.

The suggestion to toss the import problem to the President came from the Senate finance committee. It was a compromise between the quotas demanded by Sen. Matthew M. Neely of West Virginia and 16 other members and the opposition of the administration to any restrictions at all.

Domestic producers did not receive the idea with any great enthusiasm. They pointed out it still leaves the problem in the hands of officials who are opposed to any restraints on international trade. On the other hand, supporters of the provision in the committee said it would serve as a whip over imports.

How it works . . . Under the committee provision, the Office of Defense Mobilization would lay before the President any cases where imports are believed to affect national security.

The President then could order an investigation. If the ODM belief was supported he could take action to "adjust" imports, presumably by ordering quotas or increasing duties.

The acceptance of this provision made it possible for the committee to avoid a vote on the Neely amendment. The committee was so sharply split on the quota idea that a single vote could have swung the issue one way or the other. Neither side apparently felt strong enough to demand a showdown.

On the first vote, the compromise was approved 12 to 3 with only Senators Kerr of Oklahoma, Barkley of Kentucky, and Malone of Nevada against it. On the second and final round, Barkley and Kerr switched and it was adopted by a 14-to-1 vote.

The committee also adopted another provision slightly strengthening the escape clause provision. It refused, however, to make it mandatory upon the President to follow findings of the Tariff Commission for duty increases. The very weak change it made provided merely that imports could be considered as threatening serious injury to a domestic industry if the commission found they "contributed materially" to that result.

Oil is big issue . . . Oil imports are the big issue in the fight over a 3-year extension of the Reciprocal Trade Act. The bill got through the House without restrictions by a narrow margin.

The demand for limitations was even more insistent in the Senate, and the administration pulled out all the stops in its fight to head it off.

This brought from Senator Neely a demand that the attorney general consider the possibility of prosecuting State Department officials for lobbying with appropriated money. Neely charged that publication of a State Department memorandum opposing his quota proposal was in effect lobbying *(The Oil and Gas Journal, April 18, page 111)*. In that memorandum, department oil experts presented 10 reasons why quotas should not be adopted.

Neely not through . . . Although his quota plan met with no acceptance in the finance committee, Neely has not given up the fight.

He is expected to make another drive for it on the floor of the Senate. But since his quota would apply only to oil and the compromise plan worked out by the committee could be applied to any commodity, it is not expected he will get enough support to put it over.

Supporters of the committee provision say it is more along the line of the recommendations of the cabinet fuels committee.

It leaves room for the voluntary restriction of oil imports which that committee proposed. And it makes possible the "appropriate action" which the committee said should be taken if imports exceed "significantly" the proportion to domestic production they held in 1954.

Ike favors bill . . . The bill got a boost from President Eisenhower April 27. He told a news conference he thought the committee provision on imports was fine. He said he looks at the trade program from the standpoint of all the people and this outlook naturally includes national security.

With the President's approval, the bill is seen as having a good chance of going through Congress as written by the finance committee. It may take as much as 2 weeks for it to get through the Senate, however. It then will have to go back to the House for approval of the changes the Senate will make.

NPC report due . . . The National Petroleum Council also will have something to say about imports this week. But a report on imports that will be submitted to the spring meeting May 5 will be factual and is not expected to carry any recommendations.

The NPC committee which made the study reportedly will say that the increase in crude imports and loss in crude exports have hurt some segments of the domestic industry, and further increases in imports will create serious damage.

Imports Proposal Text

This is what the Senate finance committee proposes to control imports:

"Section 2 (b) In order to further the policy and purpose of this section, whenever the director of the Office of Defense Mobilization has reason to believe that any article is being imported into the United States in such quantities as to threaten to impair the national security, he shall so advise the President, and if the President agrees that there is reason for such belief, the President shall cause an immediate investigation to be made to determine the facts.

"If, on the basis of such investigation, and the report to him of the findings and recommendations made in connection therewith, the President finds the existence of such facts, he shall take such action as he deems necessary to adjust the imports of such article to a level that will not threaten to impair the national security."

Gas Users May Score

Outlook for continued use of escalation, favored-nation, and similar clauses dim as Harris bill moves to Senate

WASHINGTON. — Escalation, favored-nation, and similar clauses may be a thing of the past in natural-gas contracts.

This was the outlook last week after the House interstate commerce committee completed 3 weeks of hearings on the Harris and other bills, and sent them to the Senate where hearings begin this week. Consumer interests made a strong fight against the exemption of producers from Federal Power Commission price regulation. There was no indication they swung the majority of the House committee their way—but it does look as if they made a point on the clauses.

Death of the various clauses could be accomplished by giving the FPC power to pass on purchase contracts made by the interstate pipelines and escalations could be limited to those needed to meet new taxes as they are imposed or to previously agreed upon increases at fixed periods.

The changes suggested by the pipeline companies are expected to be written into the bill. They are acceptable to the producers. But consumer spokesmen opposed the allowance of field prices as the basis for rates on pipeline-produced gas.

Some of the demands of the coal interests least objectionable to the gas producers may be included. But the committee is not expected to adopt the program laid down in the Staggers bill, which coal witnesses indicated it must if it is to have their support. The coal demands have a certain nuisance value, however, and it may be necessary to make some concessions to keep coal-state votes.

Price raise claimed . . . In the final week of hearings the committee was told exemption of producers from price control will cost gas consumers $800,000,000 a year on top of the nearly $200,000,000 added by price increases since 1950.

This estimate was made by Edward D. Hollander, national director of Americans for Democratic Action. Hollander charged the natural-gas market is not and cannot be a free competitive market, but has many characteristics of a "natural monopoly" and requires regulation in the public interest.

A number of state governors and city officials have filed their views with the committee, either personally or in writing. They show a sharp split over the bill. There was no agreement on whether regulation would keep consumer rates down or limit new supply.

Figures Favor Gas

Producers' price increase small since World War II

WASHINGTON. — The natural-gas industry, eye-sore from staring at various figures, has begun to fight back with some statistics of its own.

The counterattack began as Sen. Warren G. Magnuson, chairman of the Senate interstate commerce committee, prepared to open hearings on the Harris bill May 3. The Senate study is expected to run through most of the month.

As the bill began its switch from the House to the Senate, the General Gas Committee in Washington released some figures compiled by Dr. John W. Boatwright, manager of distribution economics of Standard Oil Co. (Ind.).

His figures showed that for the United States as a whole, with the seven southwestern producing states omitted, the average field price paid the producer in 1953 was 11 cents per M.c.f. The average price at the city gate was 28 cents. The average rate to residential users was 91 cents.

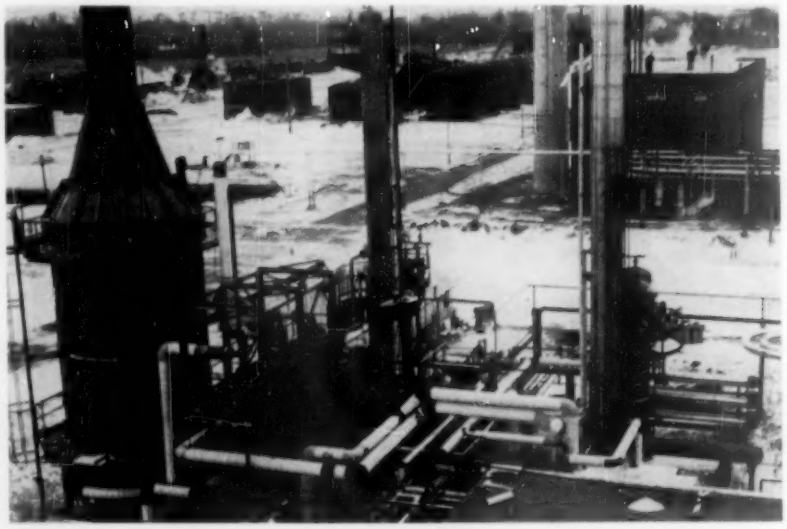
The producer price in the various areas ranged from 7 to 14 cents per M.c.f. and the city gate price ranged from 20 to 52 cents. The residential consumer rate ranged from 72 cents to $2.61. Boatwright explained that the high rate, in New England, was due to the higher cost of manufactured gas.

Boatwright pointed out that while consuming areas have complained of rate increases, the producers' average price—the only point where state or federal regulation did not apply—increased only 2.7 cents per M.c.f. between 1948 and 1953. And part of this increase resulted from higher state taxes such as those on production and gathering, he said, so that the producer did not get the full increase.

Compact Bill Passes Test

WASHINGTON.—Extension of the Interstate Oil Compact passed its first (breath-taking) test in Congress last week.

The Senate interior committee managed to wade through the 868-word sentence in which Sen. Everett Dirksen of Illinois and 36 other members asked that the compact be extended for 4 years. When they caught their breath, committee members voted unanimously to approve the measure.



Canadian Refinery Projects Mushroom

Expansion work is booming at a record rate at Canadian refineries with catalytic reformers accounting for most of the work. This 2,000-bbl. per day capacity Catformer was installed by British American Oil Co., Ltd., and placed on stream at Calgary—the biggest to be added to a western refinery. British American is building a second unit rated at 13,000 bbl. per day at its Montreal East refinery. Other refiners are building seven cat reformers with 46,000-bbl. daily output at plants mostly in Ontario.

Synthetic Stockpile?

Goodyear chairman urges new rubber-reserve plan

WASHINGTON.—The new privately owned synthetic-rubber industry was urged last week to build a national stockpile like that of natural rubber.

P. W. Litchfield, chairman of Goodyear Tire & Rubber Co., said a reserve stock of synthetic rubber may become necessary from an economic as well as a security standpoint. The natural-rubber stockpile is sufficient to meet military and essential needs through a 5-year emergency. He did not say how large a synthetic reserve should be held.

Litchfield also called for a stepped-up rubber-planting program in the Western Hemisphere. There are signs, he said, that production in the Far East may not expand in pace with growing demand for natural rubber. And, he added, a Communist raid on southeast Asia could cut off 90 per cent of the world supply.

When the Baytown, Tex., plant is sold, we will have a synthetic capacity of 1,028,000 long tons a year. Foreign synthetic capacity is estimated at 140,000 tons. Natural-rubber capacity is about 1,850,000 tons.

Supply and demand . . . Against this possible 3,018,000 tons a year, Litchfield said, current demand is 2,705,000 tons. The balance between supply and demand, therefore, is satisfactory. But it is delicate and temporary. Demand is expected to increase steadily over the next few years. There is a span of 7 years between planting and harvesting of natural rubber, and most of the increased demand will be for synthetic.

West Coast Line Revived

WASHINGTON.—Reported plans of the Navy to seek money for a pipeline from Elk Hills to the Los Angeles refinery center may reopen the whole question of West Coast oil transportation.

A congressional investigation of the petroleum supply situation in that area is proposed in a resolution offered by Rep. Dewey Short of Missouri. Short is ranking Republican member of the House armed services committee, which would make the study.

A probe into conditions on the Pacific Coast undoubtedly would again bring up the proposal of L. M. Glasco of West Coast Pipe Line Co., Dallas, to build a big-inch crude pipeline from Texas to California with government help. Short said last year such a line would be valuable. But the Defense Department has refused to certify it as essential to national security.

WATCHING WASHINGTON

Bertram F. Linz

Senator Scans Automation

What will "push-button" industry do to the economy?

Sen. Joseph C. O'Mahoney of Wyoming, for one, thinks Congress ought to find out what effects automation will have.

Industry favors automation. It says that unless it is adopted quickly the nation will not be able to keep pace with the rising demand for goods and services. Labor fears it will throw large numbers of workers out of jobs. But industry, again, says it will make more jobs than it displaces.

The Wyoming senator sees a number of problems ahead. Displacement of labor and shifts and distortions that may arise in the distribution of purchasing power are important questions. So are the sound and equitable distribution of the gains expected in productivity, the impact of automation upon the business structure, and its effect on the volume of private investment.

But industry has a good argument for robot production lines. Our population is increasing rapidly. So are its demands for goods and services. These demands must be met with a proportionately smaller labor force due to the small "depression crop" of babies now reaching working age. Only by using mechanical "slave" labor wherever possible and saving human labor for the more important tasks will it be possible to keep production apace of demand.

Highway Costs Rising

Congress is studying a $101 billion, 10-year highway building program—more than twice the amount spent on road and street construction over the past 30 years.

The struggle to keep up with the growing demands of traffic is best shown by cost figures. In 30 years nearly $45 billion was spent in capital outlay on roads and streets. Maintenance, administration, and interest brought the total cost to more than $80 billion. And still the need for new traffic lanes is as great today as it was in 1925.

Road and street construction hit the billion-dollar mark in 1925. From then on, except for 3 depression and 5 war years, it remained above that figure. The two-billion dollar mark was reached in 1949, and for the past 2 years spending topped $3 billion. Nearly one-half of the total went into state highways.

Since highway building costs nearly twice as much as it did in 1941 the larger sums of recent years haven't built as much mileage. But higher costs show up even more clearly in figures on maintenance. It costs almost two-thirds as much to keep roads and streets in shape as is spent on new ones. Before 1941 it cost only about half as much as new construction.

Last year, $2,803,000,000 was spent for new state highways. Maintenance, administration and interest brought the total cost to $3,890,000,000. County and local roads cost $545,000,000, but with other costs the total was $1,298,000,000. Urban streets cost $453,000,000, but they carried a charge of $584,000,000 for maintenance and interest. All told, out of $6,280,000,000 spent on highways, roads, and streets, only $3,856,000,000 went into new construction.

Rubber Days Over

The Government this week is just one step short of being out of the synthetic rubber industry.

All of its operating plants except the big GR-S producer at Baytown, Tex., were transferred to private owners last week. The disposal commission, which engineered one of the biggest sales ever held by the Government, is studying offers for the Baytown plant.

The deadline for bids on Baytown was April 29. That was just 1 year and 2 days after the commission opened the first bids on its rubber industry. It has until the end of this month to work out a deal. The sale will go to Congress for review by mid-June.

The Government will get $310,565,000 out of the sale of the 24 plants, the inventories, and equipment already transferred. When the Baytown sale is buttoned up it should get another $2,000,000 to $5,000,000. Baytown has a capacity of 44,000 tons a year. A 44,000-ton GR-S plant at Louisville, Ky., brought $2,340,000 and a 49,000-ton plant at Baton Rouge, La., brought $5,000,000.

Flood Blocks Avoided

Thick oil sands, high viscosities don't hinder California water flooding; gas injection also is proving valuable

D. H. Stormont

LOS ANGELES. — Thick oil sands and high oil viscosities—two properties of California fields expected to hinder their successful water flooding —may not be the stumbling blocks at first feared.

N. van Wingen, Los Angeles consulting engineer, told members of the Pacific Coast district of the American Petroleum Institute here last week that it appears these two problems have been erased, but said none of California's 34 floods have been under way long enough for an engineering interpretation to be made of their economic value.

Reporting on a statistical study made by the A.P.I. committee on production practice, he revealed that 32 of these floods were taking a total of 73,000 bbl. of water daily. Except for 7,000 bbl. of sea water being used in two Wilmington floods, all projects were using formation waters. The area affected by the floods totaled 2,500 acres at the first of the year.

Commenting on the two properties which make California floods different from those in the Mid-Continent, he said the average amount of zone perforated is 240 ft. Actual amount of productive sands in these intervals averages only 115 ft. and ranges from 22 to 645 ft. Of the 18 projects which submitted data on this point, 77 per cent of the zones open to injection were found to be taking water. Reservoir properties varied widely, as shown in the table:

Property	Range	Av. value
Permeability	34-2,000 md.	480 md.
Porosity	15-43 per cent	28 per cent
Oil gravity	8-35° A.P.I.	23° A.P.I.
Reservoir oil viscosity	0.6-320 cp.	44 cp.

Other data gleaned from the study included:

...Depth of projects ranged from two in the less than 1,000-ft. group to two in the 6,000-7,000- ft. group. Of the others 8 were in the 1,000-2,000-ft. class, 7 in the 2,000-3,000-ft. class, 9 between 3,000 and 4,000, and 2 each in the 4,000-5,000 and 5,000-6,000-ft. groups. Eighteen are using a peripheral type flood plan, and 12 are using a pattern arrangement.

...Reservoir pressures for the 28 projects reporting is 590 psi., van Wingen said, with surface injection pressures varying from a vacuum to 2,500 psi.

"The pressure which is being applied to the sand face in injection wells ranges from 0.5 psi. per foot of depth to the sand to 1.05 psi., with the majority of the projects falling within the 0.4 to 0.8-psi. range," he said. "The 0.4-psi. value is low compared to pressures imposed in the majority of the projects east of the Rockies. This low injection pressure gradient is attributable to the high permeability of the California sands which should take excessively large amounts of water at higher injection pressures."

...Chemical treatment of injection water is not used in 11 of the 32 projects. The others use various chemicals as bactericides, corrosion and scale inhibitors, and as surfactants. Twenty of the 27 using filters are employing various combinations of diatomaceous earth, asbestos, and perlite as filter-aid materials in pressure leaf type units.

...Injected water volumes range from 72 to 10,700 bbl. daily. The latter is at the Russell Ranch unit in Cuyama Valley. In a shallow zone of the Dominguez field, 10,000 bbl. of brine daily are being returned through 17 injection wells.

Flood tracers . . . In 10 of the floods, tracers were used in an effort to follow water movement. Compounds used were boron, uranian dye, fluorescein, and sodium chromate. The latter, used in two floods, was the only one later detected in producing wells.

In commenting on their use, T. J. Nowak, Union Oil Co. engineer, said in one instance the sodium chromate was continuously injected at a concentration of 25 p.p.m. In the other, it was injected in three slugs, each composed of 500 lb. of chromate per 40 bbl. of water. In the latter case production from a well 330 ft. distant was sampled every 3 days.

F. J. Parker of Union Oil Co. reported that 35 per cent of all oil-well gas produced in California was being reinjected to maintain reservoir pressure and as a means of lifting. He said that 26 such projects under way are taking about 660,000 M.c.f. daily.

Price a factor . . . Constantly increasing field prices of natural gas are making these projects look more attractive, he declared. In the early thirties gas was worth up to 5 cents per M.c.f. Since World War II it has climbed from 12 to 19 cents and is still rising.

Results of gas injection programs at various San Joaquin Valley fields, were presented indicating they were financially successful.

F. T. Lloyd of Richfield Oil Corp. brought out that gas-lift methods also were performing quite well. Records were presented on 325 wells with working fluid levels below 7,000 ft., or below 5,000 ft. in wells producing more than 500 bbl. of fluid daily.

These analyses showed from the servicing viewpoint: of 49 wells on continuous gas lift, in only one had the tubing been pulled; 51 plunger-lift wells had a 0.05 job per year frequency; and 10 using intermitters had a 1.7 job frequency. On the other hand 120 beam-pumped wells had a 4.8 job frequency, 31 long-stroke units 2.5, and 33 conventional hydraulic pumped wells needed pulling 2.4 times per year.

Rates vary . . . Gross production rates varied from 5 to 2,971 bbl. daily. Me-

It's A Deal

Officials of Kerr-McGee Oil Industries, Inc., and Deep Rock Oil Corp. got together in Tulsa last week to sign the final papers closing the $17,000,000 sale of Deep Rock properties to Kerr-McGee. D. A. McGee, president of Kerr-McGee, left, and Carl A. Houy, Deep Rock vice president, were among the representatives for their firms. Kerr-McGee has taken over the refining, marketing, and pipeline activities of Deep Rock. Kerr-McGee will market its products under the Deep Rock name through hundreds of service stations in the Midwest.

dian rates for each group were: 126 beam pumped, 40 bbl.; 51 plunger operated, 42 bbl.; 53 hydraulic wells, 90 bbl.; long-stroke units, 95 bbl.; 49 continuous gas lift, 170 bbl.; and 10 on intermittent gas lift, 690 bbl. daily.

Of the beam-pumped producers, most were using sucker rods of 1.65 to 2.00 nickel content. Some carbon rods and few high tensile rods with 3.25 to 3.75 per cent nickel were reported. Tubing in these wells was predominately 2½ in. E.U. grade J-55. Some H-40 tubing was used in both tapered and combination strings but little grade N-80 had been used in mixed strings, the survey showed. No full string of either 2 or 3-in. tubing was reported.

Knight Signs Bill

California conservation measure goes into effect

SACRAMENTO.—The controversial California "conservation" law which gives official legislative sanction to voluntary activities of the Conservation Committee of California Oil Producers has been signed into law by Gov. Goodwin Knight.

Knight signed the bill after Richfield Oil Corp. asked him to veto it. He declared the measure will greatly aid conservation of the state's oil and gas resources.

The governor added the bill will make possible close cooperation between the conservation committee and the division of oil and gas by officially recognizing a cooperation which has existed for a number of years.

Actually the measure does little more than admit existence of the committee and declare that its M.E.R. recommendations and intrapool distribution formulas are lawful and in the interest of conservation.

Earlier in the week Richfield's president, Charles S. Jones, wired Knight to veto this "vicious piece of legislation," calling it deceptive and meaningless Jones said "if it becomes law, opponents of real conservation will attempt to make people believe that California has an adequate conservation law."

Jones declared the legislature in passing the measure "has given its blessing to recommendations made by committees of oil producers but says that nobody has to pay any attention to them."

L. R. Rogers of Superior Oil Co., chairman of the conservation committee, commended Knight for his action —"making it possible for oil producers to carry on oil conservation on a voluntary basis, without compulsion, and with the aid of the Division of Oil and Gas."

ROCKY MOUNTAIN

Leasing Rush Seen

Clarifying Montana's law clears way for operators

HELENA, Mont. — The Montana Land Board is getting set for an expected flood of applications for oil and gas leases under terms of the 1953 indefinite-term leasing law recently validated by a state court under orders from the U.S. Supreme Court.

The Helena District Court ordered the board to lease under terms of the indefinite-term act after the national tribunal reversed a Montana Supreme Court decision holding the law unconstitutional.

The board has not set a date for a lease sale, but the announcement is expected soon. The board held its last land lease in early January, under terms of the old 20-year leasing law.

Three of the first eight applications filed under the 1953 law were submitted last week by Lawrence Barker, Jr., Billings, independent operator, who was rebuffed by the board a week earlier in his effort to have the agency invite applications from the oil industry.

The 1953 law allows state school lands to be leased for 10 years or as long thereafter as oil or gas is produced in commercial quantities.

Pacific Northwest Ready

WASHINGTON.—Pacific Northwest Pipeline Corp. cleared its last hurdle—financing—here last week.

The firm, which proposes to build a 1,466-mile, natural-gas line from Ignacio, Colo., to Bellingham, Wash., *(The Oil and Gas Journal, June 28, page 84)* received Securities and Exchange Commission permission to sell securities to finance the construction.

In allowing the company's certificate to become effective, the SEC, in effect, approved the firm's financing plans. The FPC had given its approval to the financing previously.

Meanwhile a new U. S. Steel Corp. plant at Provo, Utah, has begun turning out welded steel pipe for use in the $163 million project.

Production of the 26-in. pipe is the first project for the plant.

Up to 240,000 tons of pipe will be used in the main gas transmission system, a Pacific spokesman said.

Construction is expected to start sometime in May. Plans call for 650 miles of main line to be laid this year. In addition, about 100 miles of lateral will be laid.

Directional Drilling May Extend Gas Field

Magnolia Petroleum Co. has reached 6,945 ft. in the second well to be drilled from the company's huge platform 14 miles southwest of Sabine Pass, Tex., and about 8 miles out in the Gulf of Mexico. This second well, the 2-A on Magnolia's Block 10 lease, is an attempt to extend gas production established by the 1-A in mid-March (The Oil and Gas Journal, March 28, page 97). The first test was drilled to 13,386 ft. and plugged back and perforated at 8,016-30 ft. It indicated production on open flow of about 25,000,000 cu. ft. of gas daily. The platform is located near the western boundary of Block 10, one of two adjoining 5,760-acre lease blocks for which Magnolia paid the State of Texas more than $4,500,000 during a tidelands lease sale in December 1953. The 1-A was completed in Block 10, the 2-A will be directionally drilled to bottom at 10,500 ft. in Block 9 which adjoins Block 10 on the west.

World Output Surges

Increased production for every major oil region except Canada shoots international output to all-time record

A SHARP rise in crude-oil production in February brought total free-world output to a new all-time high.

World production, exclusive of Russia and other Communist countries, averaged 13,472,300 bbl. daily, up 268,800 bbl. or about 2 per cent over the previous month, and up 11.5 per cent over a year ago.

Free-world output outside the United States reached 6,637,300 bbl. daily, an increase of 194,800 bbl. daily, or 3 per cent, over January. Compared with a year ago, production was up 934,600 bbl., or 16.3 per cent.

The high world total was caused by increased production in all major oil producing countries with the exception of Canada. Output there declined 3,000 bbl. daily from the all-time high of 318,000 bbl. in January. February output in the United States was at a record high average of 6,835,000 bbl. daily, up 74,000 bbl. daily, or 1.1 per cent from the previous month.

The biggest gains in production were in the Middle East where over-all output was up 155,400 bbl. daily, or 5.3 per cent. The 3,650-sq.-mile sheikhdom of Kuwait accounted for most of the increase. Production there rose to 1,086,600 bbl. daily, up 73,300, or 7.2 per cent over the previous month, exceeding the previous all-time high of last October.

Iranian production under the consortium continued to rise at a steady pace. The output of 263,000 bbl. was up 36,000 bbl. daily, or 15.8 per cent over the previous month. January production, in turn, was 21.4 per cent higher than December while the December level was up 28 per cent over November.

Production in Qatar reached 113,500 bbl. daily, an increase of 11,500 bbl. daily, or 11.3 per cent, for a new record. Production in Iraq was up 25,700 bbl. daily, or 4 per cent, to 662,600 bbl. daily over the previous month; and in Saudi Arabia up 8,600 bbl. daily, or 0.9 per cent, to 923,000 bbl. daily.

In Venezuela, production reached an all-time high for the fourth straight month. The total output of 14 operating companies averaged 2,149,800 bbl. daily, up 38,400 bbl. daily, or 1.8 per cent. The three largest producers accounted for about 88 per cent of the output. They were: Creole Petroleum Corp., 992,337 bbl. daily; Shell, 584,240 bbl. daily; and Mene Grande Oil Co., 322,369 bbl. daily.

The most important increase in Western Europe was in West Germany, where 61 fields are producing. Output was up 1,800 bbl. daily, or 3.2 per cent, to 57,200 bbl. daily. The increase over a year ago is 19.2 per cent.

After considerable time, production in fields of the Hanover area of West Germany again has taken the lead. In February the total for 30 Hanover fields averaged about 21,000 bbl. daily, about 100 bbl. more than the 6 producing fields in the Emsland region. With intensive development work under way, the most marked increase was in Dueste-Wietingsmoor field of Weser-Ems area. Production rose from 270 bbl. daily in January to 640 bbl. daily.

Production in France was 12,100 bbl. daily, down slightly from the previous month. Development work by French Esso Standard Co. in the Parentis area, however, is expected to raise production in the near future. Esso accounted for about 5,700 bbl. daily of French production in February.

TREND OVER THE LAST YEAR

1954—	Western Hemisphere less U. S.	Middle East	Non-Communist countries
February	2,710.7	2,546.9	5,702.7
March	2,642.9	2,767.6	5,872.7
April	2,565.1	2,642.0	5,653.1
May	2,639.3	2,766.0	5,863.8
June	2,648.5	2,685.0	5,805.5
July	2,667.0	2,758.7	5,890.9
August	2,663.7	2,749.5	5,891.9
September	2,704.5	2,702.2	5,879.2
October	2,750.0	2,898.6	6,141.6
November	2,856.5	2,844.6	6,193.6
December	2,957.7	3,001.8	6,453.3
1955—			
January	3,001.5	2,950.1	6,442.5
February	3,037.7	3,105.5	6,637.3

CRUDE-OIL PRODUCTION
(Daily average in thousands of barrels)

Country—	Feb. 1955	Jan. 1955	Feb. 1954
Western Hemisphere:			
Argentina	92.0	92.0	84.5
Bolivia	6.4	6.3	4.6
Brazil	5.5	5.0	2.2
Canada	315.0	318.0	272.0
Chile	6.0	6.0	4.7
Colombia	103.5	102.4	114.5
Cuba	0.5	0.5	0.1
Ecuador	9.6	9.8	8.3
Mexico	235.0	235.0	201.0
Peru	47.3	47.2	47.5
Trinidad	67.1	67.9	63.4
Venezuela	2,149.8	2,111.4	1,907.9
Total	3,037.7	3,001.5	2,710.7
W. Europe and Africa:			
Algeria	1.2	1.4	1.5
France	12.1	12.3	7.3
Fr. Moroco	2.4	2.1	2.3
W. Germany	57.2	55.4	48.0
Italy	2.9	2.5	1.6
Netherlands	19.7	19.7	15.4
Egypt	33.9	32.9	37.7
United Kingdom	1.2	1.2	1.3
Total	130.6	127.5	115.1
Middle East:			
Bahrain	30.1	30.1	30.1
Iran	263.0	227.0	57.2
Iraq	662.6	636.9	598.1
Kuwait	1,086.6	1,013.3	816.8
Neutral Zone	24.0	24.0	6.5
Qatar	113.5	102.0	96.8
Saudi Arabia	923.1	914.5	940.9
Turkey	2.6	2.3	0.5
Total	3,105.5	2,950.1	2,546.9
Other Asia:			
British Borneo	99.0	99.0	102.2
Burma	3.7	3.7	3.5
India	7.0	7.0	6.8
Indonesia	230.0	230.0	201.7
Japan	6.7	5.9	5.8
New Guinea	11.8	12.5	4.8
Pakistan	5.3	5.3	5.2
Total	363.5	363.4	330.0
Total, non-Communist foreign	6,637.3	6,442.5	5,702.7
United States	6,835.0	6,761.0	6,378.7
Total, Free World	13,472.3	13,203.5	12,081.4
Communist controlled countries:			
Russian zone of Austria	57.5	57.5	62.0
Romania	125.0	125.0	110.0
Russia	1,210.0	1,210.0	1,085.0
Others	36.8	36.8	34.1
Total	1,429.3	1,429.3	1,291.1
World total	14,901.6	14,632.8	13,372.5

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where completely current reports are lacking. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

Argentina Opens Door

Exploration deal with Standard of California subsidiary is first in nearly 20 years; Peron must approve contract

A STANDARD OIL CO. OF CALIFORNIA subsidiary has signed the first exploration agreement to be reached with the Argentine Government in nearly 20 years.

The agreement grants the company rights to search for oil in the territory of Santa Cruz at the southern end of the country. It is subject to the approval of President Peron and the largely nominal ratification by the Argentine Congress.

The Standard of California subsidiary is Cia. California Argentina de Petroleo. The exploration agreement was signed April 25 in Buenos Aires by Owen James Haynes, a vice president of the Standard of California subsidiary, and Orlando Santos, minister of industry for Argentina.

Terms . . . Only the bare outlines of the terms have been revealed. The Argentine Ministry of Industry said Standard of California was pledged to spend a minimum of $13,500,000 in the exploration program. If results are favorable, expenditures could run to many times this sum.

Any production developed under the deal must go first to meet the needs of Argentina and be refined within the country. Argentina's domestic production falls far short of meeting domestic requirements. Demand in the country is rising about 10 per cent annually.

The agreement reportedly provides that the production will be sold to the government at a price 5 per cent under the world market. In addition, it calls for the usual 50-50 split of profits between the producing company and the government.

Other negotiations . . . Two other major international companies are to continue negotiations in Argentina on exploration contracts. These are Royal Dutch-Shell and Standard Oil Co. (N.J.). Both have minor production in the country at present from concessions dating back before the 1935 oil law which had the effect of shutting out further foreign participation. Shell and Jersey are in active discussions with the government, and the Standard of California deal may hasten agreements with these companies.

Another American company interested in oil exploration in Argentina is Floyd Odlum's Atlas Corp., which made proposals to the government last summer. More recent reports from Buenos Aires are that Odlum has taken a prominent Argentine, Jorge Antonio, into the deal.

Industry circles also have reported recently that the Italian state company, Azienda Geoerlle Italiana Petroli, has been dickering with Argentina on a possible exploration agreement. Santa Cruz comprises a large section of the foothills area of southern Argentina, lying between the territories of Tierra del Fuego and Comodoro Rivadavia. Climatically, it is windy and dry. The principal port is Rio Gallegos.

The government company, Yacimientos Petroliferos Fiscales, drilled two producers in the territory several years ago, but they have never been commercially produced or developed.

The 1935 law in Argentina prohibited further private concessions except on a basis giving the government certain rights, including a veto on management decision. The only foreign company to operate under this arrangement was The Texas Co., which undertook a limited program in the late '30's but dropped it a short time later.

Sinai Oil Moving

First crude shipped from Feiran to Suez refinery

INTERNATIONAL EGYPTIAN OIL CO., INC., has started shipping crude oil from its Feiran terminal on the Gulf of Suez to the Egyptian Government's Suez refinery.

A 7,500-ton tanker is now moving the oil, but a larger vessel of about 25,000 bbl. capacity is expected to be put in service in November.

International Egyptian's concessions in the southern Sinai of Egypt include the area where Standard Oil Co. of Egypt made a discovery in 1949 before pulling out of the country. In January, International Egyptian brought in a new field discovery at Belayim about 8 miles south of Feiran. Two rigs are now being used to develop Belayim. Plans call for the completion of 15 more wells by the end of the year. A third rig in Feiran is expected to finish four or more wells this year.

In addition, the company has ordered a new heavy American rig capable of 13,000 ft. to explore Belayim below the two producing Miocene horizons.

In Feiran field, the company's No. 4 well is coring the Miocene oil zone, and completion is expected in the near future. By November, plans call for production sufficient to allow shipments from the terminal at a rate of around 10,000 bbl. daily.

International Egyptian is owned by Swiss, Belgian and Italian interests with Southern California Petroleum Corp. holding a minority interest.

Plant Site Picked

Venezuelan Government plans petrochem works

THE Venezuelan Government has selected a site near the Caribbean coast town of Puerto Cabello for a petrochemical plant.

The plant will use now-flared natural gas to produce 150,000 tons of fertilizers and 50,000 tons of explosives annually. It is expected to be completed by the end of 1957, at a cost of up to $30,000,000. Construction bids from American and European firms are under consideration.

The plant is a step forward in an extensive program to eliminate waste of Venezuela's natural-gas production. The government has earmarked $6,500,000 to help set up the industry.

An Italian firm, Montecatini Chemical Co., announced from Milan in January that it had signed a contract with the Venezuelan Government to build a fertilizer plant of 30,000 tons yearly capacity.

The government hopes the country will use in one way or another 50 per cent of its enormous gas output by 1958. Part of the gas output now is employed in cycling, repressuring, and gasoline plants by the operating oil companies.

Maracaibo Line Opened

The new 45-mile pipeline of Cia. Shell de Venezuela is now carrying crude from the company's Lake Maracaibo production to its Palmarejo terminal.

The $9,700,000 line was built in 3 months. Called "Lapline," the line starts from a platform in the northern part of Shell's lake concessions. It runs 18 miles in the lake and 27 miles on land to the terminal, about 12 miles north of the city of Maracaibo. Under a pressure of 400 psi., the line will have a daily capacity of 100,000 bbl.

The underwater section of the line is 16-in. diameter pipe. The overland section is 24-in. pipe.

From Palmarejo, part of the crude will be shipped to Cardon via an existing line for refining and export. *(The Oil and Gas Journal, November 8, 1954, page 135.)*

Cuban Plants Planned

Texaco will build 20,000-bbl. refinery to process crude from Colombia; Shell and Esso projects also reported

CUBA is shaping up to become the center of an important oil-refining industry within the next few years.

If presently slated projects are carried out, the republic will end up with a total processing capacity of about 80,000 to 85,000 bbl. daily.

Here are the refinery plans:

. . . A new plant of The Texas Co. of 20,000 bbl. daily capacity. This project was disclosed by the company last week.

. . . Perhaps a bigger refinery, to be built by the Shell organization, of a reported 25,000-30,000-bbl. daily capacity.

. . . A major expansion of the present small refinery of Esso Standard Oil Co., S. A. This would give the refinery a capacity of 30,000 bbl. daily or more.

Neither the Shell nor the Esso projects have yet been officially announced by the companies. However, reliable reports in the industry are that planning is well advanced on both.

Present refining capacity in Cuba is around 8,000 bbl. daily. The Esso refinery at Havana is rated at 6,500 bbl. daily. There are also two small plants operated by Cuban interests, one of about 1,000 bbl. daily at Cabaiguan and another of about 200 bbl. daily capacity at Jarahueca.

Against this, Cuban consumption last year amounted to about 55,000 bbl. daily. Last import figures available are for 1953, and in that year, total imports, including crude oil, averaged slightly more than 47,000 bbl. daily. Of this, 27,000 bbl. daily was fuel oil.

Texaco project . . . Texaco's plans for a Cuban refinery were announced at the company's annual stockholders' meeting in New York. The company has land under option at Santiago on the southeast coast of the island where the plant is expected to be located.

Texaco's Cuban refinery will be built to handle increased production from Velasquez field in Colombia and "to take advantage of new marketing opportunities which we foresee in certain Latin American countries," according to Augustus C. Long, Texaco president. The refinery is scheduled for completion by the beginning of 1957.

Velasquez field was discovered by Texas Petroleum Co. in 1946 and represents the outstanding new production developed in Colombia since the end of the war *(The Oil and Gas Journal, March 14, page 123)*. A 112-mile, 12-in. pipeline is being built to move the crude to the Barrancabermeja terminal of the Andian National Line which extends to the Caribbean. This line will have a capacity of 31,000 bbl. daily, which can be increased to 45,000 bbl. daily.

Other projects . . . As far as is known, none of the three new projects has been contracted. Where Shell will build and what type of refinery have not been decided. Esso's new facilities would provide a large, modern refinery at the present site. Besides the crude unit, the present Esso plant has 2,400 bbl. daily capacity in thermal cracking.

The small Cabaiguan refinery, owned by Refinadora Cabaiguan, S.A., is now engaged in upping its present small capacity. The plant charges Venezuelan crude. C. J. Simpson Drilling Co., which bought the old Socony-Vacuum Oil Co., Inc., refinery at Olean, N. Y., when it was closed down last year, has sold some individual pieces of equipment, including a Badger rerun unit and tankage, to the Cabaiguan operation.

All the new refineries projected for construction in Cuba would operate on imported crude oil. Recent exploratory work on the island has met with some success, but production is still small. Reports are that about 1,500 bbl. of oil daily is now being produced from Echevarria field near Jatibonico and used as fuel without processing.

Esso Changes in France

Esso Standard S.A.E. Francaise will set up a new company for oil exploration and production in France. It will be called Esso-Rep.

Esso Standard will own 89 per cent of the capital, the French Government 10 per cent, and Finarep 1 per cent.

The company will develop and operate Esso Standard's holdings in the Parentis area and will assume responsibility for any new discoveries that may be made in Esso Standard concessions.

The president and seven managers of Esso Standard will serve on the board of directors of Esso-Rep. Two other directors will be named by the French Government-sponsored agency, Bureau de Recherche des Petroles.

Crude production from the Parentis area is expected to be about 10,000 bbl. daily in April and May. During July, August, and September, production is slated to rise to an average of about 20,000 bbl. daily.

Pomp and Circumstance at British Refinery

Queen Elizabeth and the Duke of Edinburgh recently toured the Kent refinery of British Petroleum Co., Ltd. The 80,000-bbl. plant is one of Britain's largest and most modern refineries. The Queen is shown arriving at the refinery with Lord Strathalmond of Pumpherston (formerly Sir William Fraser), chairman of BP., center, and C. S. Cleverly, general manager of the refinery. In the background are the atmospheric distillation unit (left) and the two vacuum units. Six thousand employes and their families turned out to welcome her majesty.

Ammonia Goes Latin

Puerto Rican company will build island's first plant

GONZALEZ CHEMICAL INDUSTRIES, INC., of San Juan, Puerto Rico, has completed financing of a 115-ton per day ammonia plant to cost about $12,250,000. The first ammonia project for the island will be located in the southwestern sector of the island on Guanica Bay.

The company, headed by Luis R. Gonzalez, is negotiating with Lummus Co. to design and build the plant. It will be based on heavy fuel oil, which will be converted to hydrogen-rich synthesis gas by the Texaco combustion process. Cox & Weinrich, Washington, D. C., are consulting engineers for the new chemical company.

Products, including anhydrous ammonia, nitrogen solutions, sulfate of ammonia, and possibly other solid fertilizers, will be consumed in part in Puerto Rico. The company has not yet contracted for the No. 6 fuel oil it will need, but is considering several sources.

Some heavy fuel oil will be produced in two new Puerto Rican refineries; one newly completed and one now building. Plentiful heavy fuel is also available from Venezuelan and other Caribbean refineries to the south. Plant needs will be roughly 500 bbl. per day for process alone, plus a like amount for power requirements.

The Gonzalez plant is the third recently announced to use heavy fuel oil wholly or partly to synthesize ammonia. The list includes the 125-ton per day plant of Northern Chemical Industries, Ltd., at Searsport, Maine, which will be based wholly on No. 6 fuel oil, using the Texaco process. St. Paul Ammonia Products Co., building a plant at St. Paul, Minn., will convert natural gas, but will be equipped to switch to heavy fuel if gas supplies are interrupted.

U. S. Top Neutral Zone Buyer

Of total Neutral Zone crude exported last year, 11,364 bbl. daily, or nearly 73 per cent, was shipped into the United States.

Total Neutral Zone exports in 1954 averaged 15,619 bbl. daily, on the basis of data given in a recent United States Government report.

Other destinations for Neutral Zone crude shipments were: France, 321 bbl. daily; Germany 192 bbl. daily; Italy 479 bbl. daily; and Japan 3,263 bbl. daily.

Commercial production in the Neutral Zone was commenced in December 1953 and shipments started the following month. The crude is produced from Wafra field which was discovered in the spring of 1953 by American Independent Oil Co. as the operator for itself and the other concession-holder, Pacific Western Oil Co.

Tide Water Associated Oil Co. is taking much of Pacific Western's half of production for its refining operations, in the United States. Both companies are controlled by the J. Paul Getty interests.

Oil Discovered in Angola

A wildcat well has found oil in Angola, Portuguese possession on the southwest coast of Africa.

The well is No. 2 Benfica, drilled by the Belgian company, Cia. Financiere Petrofina, about 15 miles south of Luanga, capital of Angola. Crude found at 8,400 ft. was described as light and of good quality. The wildcat has produced at the rate of 300 bbl. daily.

Petrofina officials in Brussels said the news was "extremely favorable and promising" and that commercial production probably could be developed. Petrofina has controlling interest in Cia. de Combustiveis do Lobitos (Carbonang), a Belgian company which holds a 3-year exclusive, renewable exploration concession along the coastal section of Angola.

A heavy Ideal rig was brought in for the Benfica tests. A light rig used in earlier dry holes was shipped to the Belgian Congo, bordering on the north of Angola, where Petrofina also is conducting exploration activities.

Thailand to Exploit Oil

The Thailand Government plans to produce crude oil for local consumption from a deposit in Fang district of Chiengmai, the northern province.

The Southeast Asia country has three crude oil reserves estimated at 22,000,000 bbl., according to a report from Bangkok, the nation's capital. Swiss and Italian engineers found small amounts of oil in survey work several years ago. Recent seismic exploration work established that the deposit was "of some importance."

A Thailand official reported the oil exploitation work "concerns the Government only" and not foreign oil companies established in Thailand.

Peru Rebuilds Refinery

The Peruvian Government company, Empresa Petrolera Fiscal, has completed the reconstruction of a small topping plant at Iquitos on the headwaters of the Amazon.

The plant has a capacity of about 1,500 bbl. daily and was formerly operated at Zorritos on Peru's northern coast. It will charge crude from the small producing property of Ganso Azul Cia. de Petroleo in eastern Peru.

New Zealand Lures

Shell plans new search for oil in North Island

SHELL OIL CO. of New Zealand is planning a $2,800,000 exploration program, the first such venture there by a major company in 11 years.

The search will be made with Todd Brothers, Wellington. It will be in the Taranaki district of North Island, where there has been small production for many years. It also was reported that the government will amend the Petroleum Act soon in order to clarify rights and obligations of exploration companies.

Todd Brothers, a motor distributing firm, recently took out extensive exploration licenses in many parts of the country. The joint program with Shell will be conducted on this acreage.

The Shell organization will provide experienced personnel, geologists and geophysicists, for the surface surveys to be carried out initially. Bryant Todd, a director of Todd Brothers, said J. E. Brantly, United States geologist and former foreign-division director of the Petroleum Administration for Defense, had confirmed his company's view that a renewal of oil exploration in New Zealand was justified.

Between 1938-44, 13 deep tests were drilled in New Zealand. The deepest went to 10,925 ft. Results of the exploration were disappointing, causing British and American firms to discontinue their search.

Last year, Egmont Oil Wells, Ltd., undertook an extension of present fields. Three 2,200-ft. wells were to be drilled. One produced about 25 bbl. daily.

Italian Refinery Expanding

An extensive expansion program at "SARPOM" refinery in San Martino di Trecate, Italy, is expected to be completed this summer.

Nearing completion at the 13,300-bbl. daily capacity refinery, half owned by Caltex Oil Products Co., are a catalytic cracker of 2,880 bbl. daily capacity, a vacuum unit of 5,150 bbl. daily capacity, and a polymerization plant with a capacity of 315 bbl. daily.

Facilities of the tanker terminal at Savona and of the 97-mile crude pipeline to the refinery also are being expanded. The 8-in. line has a throughput of 12,500 bbl. daily.

How to Calculate Multidraw Towers

Information developed can be used in economic studies of optimum design, studies involving the relationship of the variables on separation of oil streams, checking tower efficiencies, and as a means of designing new fractionation systems.

by N. H. Prater and C. W. Boyd

THE separation of crude oil into gasoline, kerosine, and other products in a crude-oil topping plant is relatively easy compared to the separation of hydrocarbons of 95 per cent purity and higher. As a result, the design of the crude oil topping tower is usually based on rule-of-thumb methods.

The principles of light-hydrocarbon separation have formerly been of little value in the design of crude-oil fractionating towers. But these principles also apply in the separation of complex mixtures. Crude-oil fractionating towers are multiple draw towers which further complicate the problem.

The purpose here is to demonstrate how these principles may be modified for calculating multidraw towers.

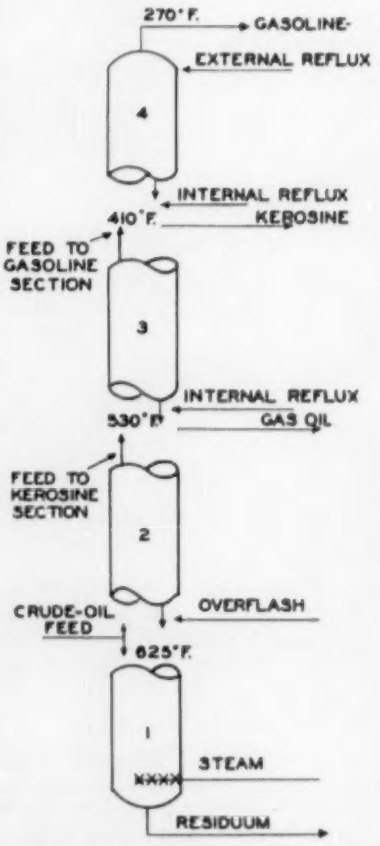
1. THE SIDE-DRAW TOWER

When a crude oil is heated in a furnace and introduced into the flash zone of a distillation column, the more volatile, low-boiling fractions rise while the high-boiling, less-volatile components flow down into the bottom section.

Top temperature . . . The temperature at the top of the column corresponds to the dew point of the overhead fraction. But due to the presence of inert gases, such as steam and gaseous hydrocarbons, the effective pressure of the condensable hydrocarbons is reduced. Because of this, the top temperature is lower than the boiling point of the highest boiling component in the mixture. Normally it is very close to the 70 per cent point on the A.S.T.M. distillation curve of the material leaving the top of the column, after the curve has been corrected to the effective pressure existing at the top of the column.

Gradient . . . A temperature gradient exists between the flash zone and the top section of the tower. The temperature of the liquid on each tray is lower than the temperature of the liquid on the tray below, and the temperature on each tray is the bubble point of the liquid on that particular tray. This permits separation of the various boiling range fractions in a tower.

Complex mixtures . . . The conventional methods used for analyzing the involved phenomena are far from being accurate when complex mixtures are involved. Some high-boiling components appear in the overhead product and some low-boiling components are found in the side-draw products. When wide-boiling-range distillates are produced from the tower, it is impossible to eliminate these effects by changing the operating conditions. This happens because the low-boiling components in the vapor act as carriers for the high-boiling components. The only difference between this phenomenon and steam distillation is that the light-hydrocarbon carriers form a single phase with the heavy hydrocarbons in the condensate.



RECTIFYING SECTIONS of crude-oil topping tower. Fig. 1.

Rectifying sections . . . A topping column separating crude oil into gasoline, kerosine, gas oil, and residuum should be considered to contain four separate sections as shown in Fig. 1. Each section acts as a rectifying column separating petroleum mixtures by removing the higher-boiling components from the vapors. Assume, for example, that in taking a gasoline fraction as overhead it is desirable to exclude all components boiling above 400° F., but to include as much as possible of all materials boiling below this temperature. The concentration of critical, high-boiling components in the gasoline fraction cannot be tolerated beyond a certain lower maximum. How well this requirement is met depends on the design of the particular section of the column where the separation is accomplished. If this is achieved, all higher-boiling materials will be substantially eliminated from the gasoline fraction.

Light ends to side draw . . . In a multidraw tower the vapors of the top products always pass the side-draw trays, and the products withdrawn from the side of the column absorb some of the lighter products. Little can be done about this in the fractionating column without changing the yield of the products. These products are usually stripped with steam to control initial boiling points and flash points. If the desired flash or initial boiling points cannot be obtained, it is necessary to raise the end point of a product withdrawn higher up the tower.

2. THE METHOD

The proposed method of calculation is based upon a true-boiling-point anal-

ABBREVIATIONS

1. Minimum Number of Theoretical Plates at Total Reflux by Fenske Method:[2]

$$S_M = \frac{\text{Log} \dfrac{(X_{LKD})}{(X_{LKB})} \dfrac{(X_{HKB})}{(X_{HKD})}}{\text{Log } \alpha_{LK}} \quad (1)$$

Where:

S_M = minimum number of theoretical plates.
X_{LKD} = mole fraction of light key component in overhead.
X_{LKB} = mole fraction of light key component in bottoms.
X_{HKD} = mole fraction of heavy key component in overhead.
X_{HKB} = mole fraction of heavy key component in bottoms.
α_{LK} = average of relative volatilities of light key component at top and bottom of tower.
α = relative volatility, which is the ratio of the equilibrium constant of the component in question, to the equilibrium constant of the heavy key component. In this calculation procedure, unless otherwise specified, all relative volatilities are geometric averages of the relative volatilities at tower top and bottom conditions, determined as follows:

$$\alpha_{LK} = [(K_{LK}/K_{HK})_{top} (K_{LK}/K_{HK})_{btm.}]^{1/2} \quad (2)$$

2. Theoretical Minimum Reflux With an Infinite Number of Plates by Scheibel-Montross Method:[3]

$$\left(\frac{L}{D}\right)_M = \frac{1}{X_{LFK} + \Sigma X_{AF}} \left[X_{LKF} \left(\frac{b}{D}\right)'_M + \left(X_{HKF} + \Sigma X_{DF}\right) \sum \frac{X_{DF}}{\frac{\alpha_{LK}}{\alpha_D} - 1} + \sum \frac{X_{AF}}{\alpha_A} \left(1 + \frac{\alpha_{LK}}{\alpha_A}\right) \right] \quad (3)$$

Where:

$(L/D)_M'$ = true minimum reflux ratio.
X_{LKF} = mole fraction of light key component in feed.
X_{HKF} = mole fraction of heavy key component in feed.
X_{DF} = mole fraction in the feed of each component heavier than the heavy key component.
X_{AF} = mole fraction in the feed of each component lighter than the light key component.
α_{LK} = average of relative volatilities of light key component at top and bottom of tower.
α_A = average relative volatility of a component lighter than the light key component.
α_D = average relative volatility of a component heavier than the heavy key component.

$$(L/D)_M' = \frac{X_P}{(\alpha_{LK} - 1) X_i} - \frac{(1 - X_P) \alpha_{LK}}{(1 - X_i)(\alpha_{LK} - 1)} \quad (4)$$

X_P = concentration of light key component in the overhead expressed as the ratio of moles of light key component in overhead to total moles of all key components in overhead.

$$X_i = \frac{P - \alpha_{LK} - R' \pm [(P - \alpha_{LK} - R')^2 + 4R' P]^{1/2}}{2R' (\alpha_{LK} - 1)} \quad (5)$$

Select the sign of the radical which will give a positive value for X_i between 0 and 1:

$$P = (\alpha_{LK} - 1)(1 + R') \frac{X_{LKF}}{X_{LKF} + X_{HKF}} \quad (6)$$

$$R' = \frac{X_{LF} - \Sigma X_{DF}}{X_{VF} - \Sigma X_{AF}} \quad (7)$$

Where:

X_{LF} = mole fraction of feed which is liquid.
X_{VF} = mole fraction of feed which is vapor.
ΣX_{AF} = total mole fraction of all components lighter than light key component in the feed.
ΣX_{DF} = total mole fraction of all components heavier than heavy key component in the feed.

ysis. The width of the fractions should not exceed 5 volume per cent. The mid-boiling points of the fractions are plotted against per cent overhead, and the resulting curve is assumed to be made up of an infinite number of pure compounds. The boiling-point curve is then divided into the desired number of hypothetical components which correspond to normal paraffinic hydrocarbons boiling within these temperature ranges. A similar curve is obtained by plotting gravities of these fractions versus per cent overhead.

How many components? . . . For practical calculations, the number of hypothetical components into which the boiling-point curve must be divided depends upon the accuracy desired. However, the width of these hypothetical components should not exceed 5-7 volume per cent.[8] The components are obtained by means of the chord area method shown in Fig. 2. The shaded areas on both sides of the curve should be equal. Each of the hypothetical components is identified by its average boiling point on the true-boiling-point curve. The volume per cent of each component is then obtained from the figure. For example, in Fig. 2, Component A has an average boiling point of 100° F. and comprises 5.5 per cent of the feed.

Methods used . . . The resulting information is used to calculate the design of the multidraw crude-oil topping tower by a combination of the Fenske method of obtaining minimum number of trays at total reflux;[2] the Scheibel-Montross method for calculating minimum reflux with an infinite number of plates;[3] and the Gilliland correlation between reflux rate and number of theoretical trays.[3]

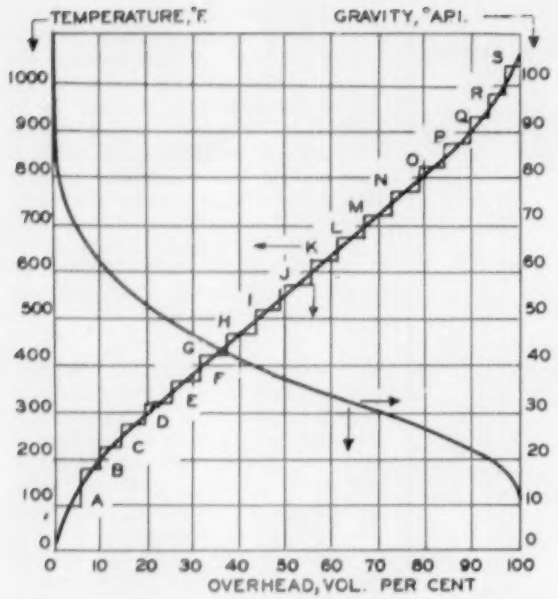
3. STEPWISE PROCEDURE

Problem: Design a crude-oil topping tower to separate 9,000 bbl. per day of a 38.4° A.P.I. Mid-Continent crude oil into gasoline, kerosine, gas oil, and residuum fractions.

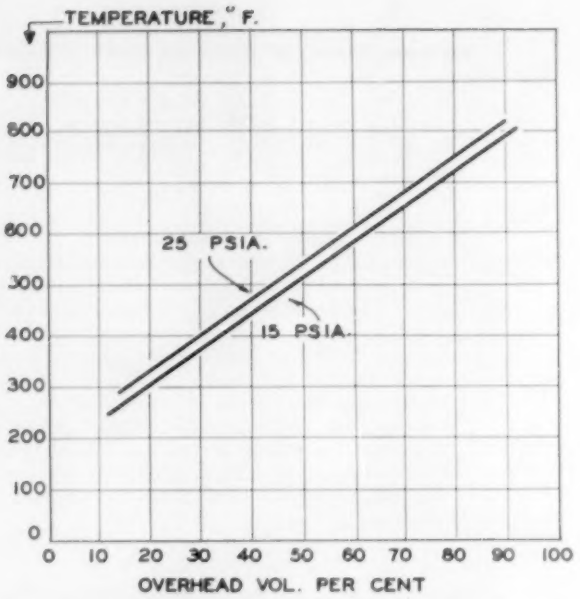
The gasoline should have an A.S.T.M. end point of 375° F. The A.S.T.M. 95 per cent point of the gasoline and the 5 per cent point of the kerosine should have a gap of 20° F.

The kerosine should have a flash point of 135° F. and an A.S.T.M. 90 per cent point of 525° F. The A.S.T.M. 95 per cent point of the kerosine and the 5 per cent point of the gas oil may overlap 13° F. to obtain maximum yield of gas oil. However, the A.S.T.M. end point of kerosine must not exceed 600° F.

A maximum yield of gas oil containing no asphaltic material and having an A.P.I. gravity of about 35 and an



TRUE-BOILING-POINT and gravity curves for 38.4° A.P.I. Mid-Continent crude oil. Fig. 2.



EQUILIBRIUM flash vaporization curves of a 38.4° A.P.I. Mid-Continent crude oil. Fig. 3.

A.S.T.M. end point not to exceed 700° F. is desired.

Operation of the tower is controlled by the end point of the gasoline, 90 per cent point and flash point of the kerosine, and maximum yield of gas oil.

The tower operates at a pressure of 25 psia. at the flash zone; 5,100 lb. per hour of steam is used to keep the flash zone temperature below 625° F.

STEP 1—Find the Theoretical Yield of Each Product.

A.S.T.M. end points are 0°-25° F. lower than the end points obtained by a true-boiling-point distillation. As a result, the theoretical yield of gasoline, kerosine, and gas oil is determined for end points of 400°, 600°, and 675° F., respectively, on the T.B.P. curve. From Fig. 2 the theoretical yield of gasoline, kerosine, and gas oil amounts to 65 volume per cent of the crude oil.

STEP 2—Determine the Hypothetical Component Breakdown for the Crude Oil.

The method is illustrated in Fig. 2 and results are tabulated in Table 1. The molecular weights of these hypothetical components were determined from correlations developed by Smith and Watson.[11]

STEP 3—Determine the Composition of the Vapor Formed by Flashing 65 Volume Per Cent of the Crude Oil.

To vaporize 65 volume per cent of the crude oil at 25 psia. requires a flash-zone temperature of 630° F. as shown in Fig. 3. The composition of the vaporized material is calculated by using equilibrium K constants published by Smith[10] and Winn.[13] The results of the equilibrium flash vaporization calculation are shown in Table 2.

STEP 4—Find the Amount of Material Stripped From the Residuum by Steam.

The residuum remaining after flashing 65 volume per cent of the crude oil flows to the bottom of the tower countercurrent to the steam used to lower flash-zone temperature. As a result, some of the low-boiling components remaining in the residuum are stripped out and must be added to the total vapor leaving the flash zone. The amount of material removed is determined by a method previously published.[8] The results of this calculation are shown in Table 3.

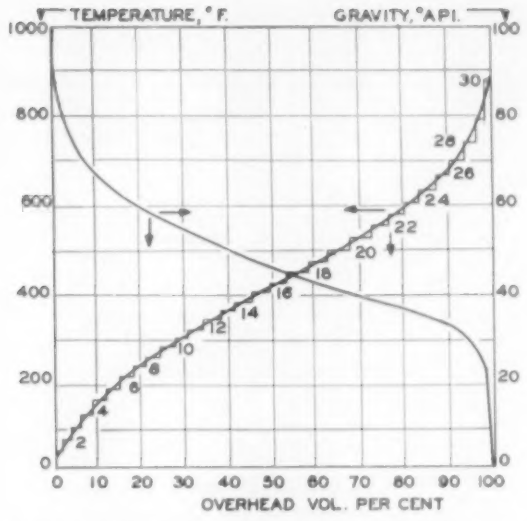
STEP 5—Determine New Flash-Zone Temperature.

The total hydrocarbon vapor leaving the flash zone is 65.07 + 2.81 volume per cent of total charge as shown in Table 4. The effective pressure in the flash zone is equal to the total moles of hydrocarbons as shown in Table 5 divided by the total moles of hydrocarbons plus moles of steam; the whole multiplied by the tower operating pressure or

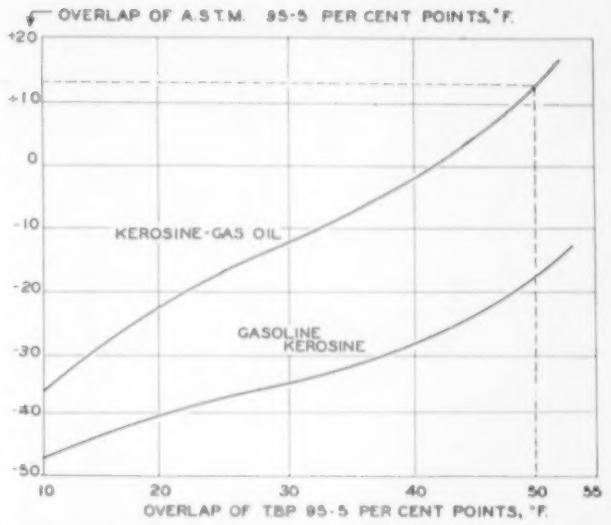
$$\frac{433.66}{433.66 + 283.33} \times 25 = 15.1 \text{ psia.}$$

TABLE 1—ESTIMATION OF HYPOTHETICAL COMPONENTS IN CRUDE OIL

Component	Vol. per cent	Midboiling point, °F.	°A.P.I.	Lb./bbl.	Lb./100 bbl.	Mol. wt.	Moles/ 100 bbl.
A	5.5	100	75.0	239.9	1,319.45	75	17.59
B	4.0	175	66.0	250.9	1,003.60	92	10.91
C	4.5	225	61.0	257.4	1,158.30	117	9.90
D	5.0	275	57.0	262.9	1,314.50	121	10.86
E	6.0	325	53.0	268.5	1,611.00	138	11.67
F	6.0	375	49.0	274.5	1,647.00	158	10.42
G	6.0	425	45.0	280.7	1,684.20	180	9.36
H	6.0	475	42.0	285.6	1,713.60	201	8.53
I	6.0	525	39.0	290.6	1,743.60	229	7.61
J	6.0	575	36.5	294.9	1,769.40	255	6.94
K	6.0	625	35.0	297.6	1,785.60	285	6.27
L	6.0	675	33.0	301.2	1,807.20	309	5.85
M	6.0	725	30.5	305.9	1,835.40	350	5.24
N	6.0	775	28.0	310.6	1,863.60	380	4.90
O	5.5	825	25.0	316.6	1,741.30	410	4.25
P	5.5	875	21.8	323.2	1,777.60	440	4.04
Q	3.5	925	18.5	330.3	1,156.05	465	2.49
R	4.0	975	15.0	338.2	1,352.80	488	2.77
S	2.5	1,025	10.0	350.2	875.50	500	1.75
	100.0				29,160.00		141.35



TRUE-BOILING-POINT and gravity curves of vapor from equilibrium vaporization of a 38.4° A.P.I. Mid-Continent crude oil. (Vapor = 67.88 volume per cent of crude oil.) Fig. 4.



APPROXIMATE RELATIONSHIP between the overlap of the 95-5 per cent points on the A.S.T.M. and T.B.P. distillation curves. Fig. 5.

Fig. 3 shows that in the absence of steam a temperature of 650° F. is required to vaporize 67.88 volume per cent of the feed at 25 psia. In the presence of steam the same results are obtained by 625° F. and 15.1 psia.

STEP 6—Determine the Hypothetical Component Breakdown of the Vapor Leaving the Flash Zone.

The same hypothetical components used for calculating the equilibrium flash vaporization are used for these calculations. However, replotting the T.B.P. curve of the flashed material and dividing it into narrower fractions improves the accuracy. The replotted T.B.P. curve and new component breakdown are shown in Fig. 4 and the properties of the new hypothetical components are listed in Table 5.

STEP 7—Determine Yield and Composition of the 400° F. End-Point Gasoline on the T.B.P. Curve.

Yields must be estimated as a preliminary step in the calculations. These can be estimated from the T.B.P. curve of the crude oil but maximum yields indicated on the T.B.P. curve of the crude oil cannot be obtained unless an infinite number of trays and infinite reflux are assumed.

Gap or overlap . . . Fig. 5 may be used to determine the approximate relationship between the gap or overlap of the 95-5 per cent points on the gasoline-kerosine A.S.T.M. and T.B.P. distillation curves. Commercial operation of crude-oil topping towers results in a lower yield of top product and different yields of intermediate products from those indicated on the T.B.P. curve of the crude oil because of the overlap of the products.

Results of typical operation on crude-oil topping towers are shown in Fig. 6 where the per cent of theoretical yield (perfect fractionation) is plotted against the overlap on the T.B.P. curves of the products.

A 20° F. gap between the A.S.T.M. per cent point of the gasoline and the A.S.T.M. 5 per cent point of the kerosine will be obtained with an overlap of approximately 50° F. on the T.B.P. curve as shown in Fig. 5. The 50° F. overlap corresponds to a 76.8 per cent recovery of the gasoline as shown in Fig. 6. The total quantity of 400° F. end-point gasoline in the vaporized fraction is 46.5 per cent as shown in Fig. 4. Therefore, the quantity of the 400° F. end-point gasoline present in the overhead fraction is 46.5 × 0.768 = 35.7 per cent.

T.B.P. of gasoline . . . The theoretical yield of gasoline having an end point of 400° F. would include all of components 1 through 16 as indicated in Table 5. However, because of imperfect fractionation, portions of the high-boiling components will be included in the kerosine distillate. The following procedure is used to determine the T.B.P. curve of the overhead gasoline fraction.

Since a 400° F. end-point gasoline is desired, Component 16 is the highest-boiling hypothetical fraction which can be tolerated in the gasoline without ex-

TABLE 2—COMPOSITION OF VAPOR PHASE FROM EQUILIBRIUM FLASH VAPORIZATION OF CRUDE OIL*
(65 per cent vapors by volume)

Component	Moles/100 bbl.	K at 630° F. and 25 psia.	L/VK	M 1 + L/VK
A	17.59	46.33	0.0057	17.49
B	10.91	31.82	0.0083	10.82
C	9.90	21.47	0.0123	9.78
D	10.86	15.63	0.0169	10.68
E	11.67	10.74	0.0246	11.39
F	10.42	7.38	0.0358	10.06
G	9.36	4.99	0.0529	8.89
H	8.53	3.37	0.0784	7.91
I	7.61	1.87	0.1409	6.67
J	6.94	1.36	0.1945	5.81
K	6.27	0.79	0.3340	4.70
L	5.85	0.43	0.6116	3.63
M	5.24	0.21	1.2489	2.33
N	4.90	0.064	4.1042	0.96
O	4.25	0.028	9.0366	0.41
P	4.04	0.012	22.7647	0.17
Q	2.49	0.008	34.5724	0.07
R	2.77	0.004	68.2500	0.04
S	1.75	0.002	125.1500	0.01
	141.35			111.82

Therefore: V = 111.82; L = 29.53; L/V = 0.264.

*All values based on 100 bbl. crude oil.

TABLE 3—COMPOSITION OF REDUCED CRUDE LIQUID LEAVING FLASH ZONE AND MATERIAL REMOVED BY TOWER STEAM*

Component	Total reduced crude liquid		Total material removed	
	Moles	Barrels	Moles	Barrels
A	0.10	0.03	0.10	0.03
B	0.09	0.03	0.09	0.03
C	0.12	0.06	0.12	0.06
D	0.18	0.08	0.18	0.08
E	0.28	0.15	0.28	0.15
F	0.36	0.21	0.36	0.21
G	0.47	0.31	0.47	0.30
H	0.62	0.43	0.62	0.43
I	0.94	0.74	0.94	0.74
J	1.13	0.98	0.90	0.78
K	1.57	1.50	....	....
L	2.22	2.18	....	....
M	2.91	3.34	....	....
N	3.94	4.83	....	....
O	3.84	4.97	....	....
P	3.87	5.27	....	....
Q	2.42	3.40	....	....
R	2.73	3.94	....	....
S	1.74	2.49	....	....
	29.53	34.93	4.06	2.81

*All values based on 100 bbl. crude oil.

TABLE 4—COMPOSITION OF TOTAL VAPOR LEAVING FLASH ZONE*

Component	From E.F.V. calculation		From stripping		Total	
	Moles	Barrels	Moles	Barrels	Moles	Barrels
A	17.49	5.47	0.03	0.10	5.50	17.59
B	10.82	3.97	0.03	0.09	4.00	10.91
C	9.78	4.44	0.06	0.12	4.50	9.90
D	10.68	4.92	0.08	0.18	5.00	10.86
E	11.39	5.85	0.15	0.28	6.00	11.67
F	10.06	5.79	0.21	0.36	6.00	10.42
G	8.89	5.70	0.30	0.47	6.00	9.36
H	7.91	5.57	0.43	0.62	6.00	8.53
I	6.67	5.26	0.74	0.94	6.00	7.61
J	5.81	5.02	0.78	0.90	5.80	6.71
K	4.70	4.50	....	....	4.50	4.70
L	3.63	3.82	....	....	3.82	3.63
M	2.33	2.66	....	....	2.66	2.33
N	0.96	1.17	....	....	1.17	0.96
O	0.41	0.53	....	....	0.53	0.41
P	0.17	0.23	....	....	0.23	0.17
Q	0.07	0.10	....	....	0.10	0.07
R	0.04	0.06	....	....	0.06	0.04
S	0.01	0.01	....	....	0.01	0.01
	111.82	65.07	4.06	2.81	115.88	67.88

*All vapor values based on 100 bbl. crude-oil feed. Total feed = 9,000/24 = 375 bbl. per hour.

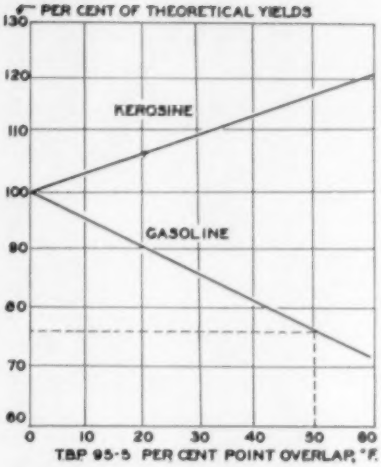
ceeding this specification. On the basis of plant data, an assumption is made that 100 per cent of Components 1-9, comprising about 70 volume per cent of the gasoline fraction, are included in that fraction. Therefore, the first section of the T.B.P. curve, up to approximately 70 volume per cent, is drawn using the boiling points and accumulative volume per cents of Components 1-9 listed in Table 6.

The end point of the gasoline on the T.B.P. curve is set at 415° F. because of the boiling range (392°-415° F.) of Component 16. The remaining portion of the curve, between the 70 per cent point and the end point is drawn using a smooth curve as shown by the dashed line in Fig. 7.

To determine the amount of Component 10 remaining in the gasoline fraction, it is noted that 270° F. on the T.B.P. curve corresponds to approximately 67.2 volume per cent and is also the "end point" of Component 9; and, 292° F. corresponds to 76 volume per cent and is the "end point" of Component 10. Therefore, Component 10 comprises 76-67.2 per cent or 8.8 volume per cent of the gasoline fraction as listed in Table 6. Components 10-16 are determined in the same manner.

STEP 8—Determine the Yield and Composition of the Kerosine.

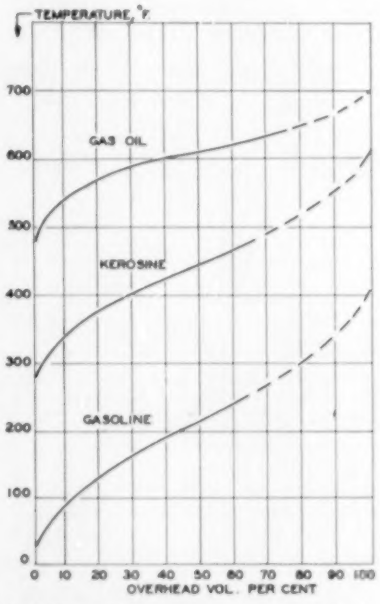
The T.B.P. curve of the kerosine is obtained in the same manner as illustrated for the gasoline and is shown in Fig. 7. The composition and properties are shown in Table 7. The allowable A.S.T.M. overlap of the 95 per cent of the kerosine and the 5 per cent point of the gas oil is 13° F. This corresponds to the 47° F. overlap on the T.B.P. curve as shown by Fig. 5. From Fig. 6 the yield of the kerosine fraction is 118 per cent of the theoretical on the T.B.P. curve or 34.1 × 1.18 = 40.25 volume per cent of the total vapor leaving the flash zone.



APPROXIMATE RELATIONSHIP between overlap of the T.B.P. 95-5 per cent points and product yields. Fig. 6.

STEP 9—Determine the Yield and Composition of the Gas Oil.

The T.B.P. curve of the gas oil is obtained in the same manner as illustrated for the gasoline or kerosine and is shown in Fig. 7. The composition



CALCULATED T.B.P. curves of products. Fig. 7.

TABLE 5—PROPERTIES OF HYPOTHETICAL COMPONENTS LEAVING FLASH ZONE

Component	Vol. per cent	Midboiling point, °F.	°A.P.I.	Lb./bbl.	Lb./hr.	Mol. wt.	Moles/hr.
1	2.0	50	91.0	222.7	445.4	70	16.19
2	2.0	80	80.0	234.3	468.6	74	16.11
3	2.0	105	74.0	241.1	482.2	78	15.73
4	3.0	135	70.0	245.9	491.8	83	15.09
5	3.0	165	66.0	250.9	752.7	90	21.28
6	3.0	190	64.0	253.4	760.2	96	20.16
7	3.0	215	61.5	256.8	770.4	103	19.04
8	3.0	237	59.0	260.1	780.3	110	18.05
9	3.0	260	57.0	262.9	788.7	117	17.16
10	3.5	280	55.0	265.7	930.0	123	19.24
11	3.0	300	54.0	267.1	801.3	130	15.68
12	3.5	318	53.0	268.5	939.8	135	17.72
13	4.0	340	51.2	271.2	1,084.8	144	19.7
14	3.0	360	49.0	274.5	823.5	152	13.80
15	4.0	380	48.0	276.0	1,104.0	159	17.67
16	4.0	402	46.0	279.1	1,116.4	168	16.93
17	4.0	425	44.0	282.3	1,129.2	179	16.06
18	5.0	450	43.0	283.9	1,419.5	190	19.01
19	4.0	475	41.0	287.2	1,148.8	201	14.53
20	5.0	500	40.0	288.9	1,444.5	217	16.95
21	5.0	530	38.8	291.0	1,455.0	232	15.96
22	4.0	555	37.7	292.9	1,171.6	244	12.22
23	3.5	580	36.7	294.6	1,031.1	259	10.13
24	3.5	602	35.8	296.2	1,036.7	270	9.77
25	4.0	630	34.6	298.3	1,193.2	289	10.51
26	3.0	660	33.5	300.3	900.9	307	7.46
27	3.0	690	31.0	304.9	914.7	325	7.15
28	3.0	725	27.0	312.6	937.8	350	6.82
29	2.5	785	23.0	320.7	801.8	390	5.24
30	1.5	920	15.0	338.2	507.3	458	2.83
	100.0						433.66

TABLE 6—COMPOSITION AND PROPERTIES OF GASOLINE FRACTION

Component	Vol. % of feed*	Vol. % of gasoline	Accumulative vol. %	Vol. % of component	Sp. gr.	Boiling range
1	2.00	5.6	5.6	100	0.636	26-65
2	2.00	5.6	11.2	100	0.669	65-93
3	2.00	5.6	16.8	100	0.689	93-120
4	3.00	8.4	25.2	100	0.702	120-150
5	3.00	8.4	33.6	100	0.716	150-177
6	3.00	8.4	42.0	100	0.724	177-202
7	3.00	8.4	50.4	100	0.734	202-226
8	3.00	8.4	58.8	100	0.743	226-248
9	3.00	8.4	67.2	100	0.751	248-270
10	3.14	8.8	76.0	90	0.759	270-292
11	2.14	6.0	82.0	71	0.763	292-308
12	1.79	5.0	87.0	51	0.767	308-330
13	1.71	4.5	91.8	43	0.775	330-352
14	1.50	4.2	96.0	50	0.784	352-370
15	1.00	2.8	98.8	25	0.788	370-392
16	0.42	1.2	100.0	11	0.797	392-415
	35.70	100.0			0.731	

*Volume per cent of total vapor leaving flash zone.

TABLE 7—COMPOSITION AND PROPERTIES OF KEROSINE FRACTION

Component	Vol. % of feed	Vol. % of kerosine	Accumulative vol. %	Vol. % of component	Sp. gr.	Boiling range
10	0.36	0.89	0.89	100	0.759	270-292
11	0.86	2.14	3.03	100	0.763	292-308
12	1.71	4.25	7.28	100	0.767	308-330
13	2.29	5.69	12.97	100	0.775	330-352
14	1.50	3.73	16.70	100	0.784	352-370
15	3.00	7.45	24.15	100	0.788	370-392
16	3.58	8.89	33.04	100	0.797	392-415
17	4.00	9.94	42.98	100	0.806	415-436
18	5.00	12.42	55.40	100	0.811	436-464
19	4.00	9.94	65.34	100	0.820	464-485
20	4.57	11.36	76.70	91	0.825	485-515
21	3.98	9.90	86.60	80	0.831	515-545
22	2.98	7.40	94.00	74	0.836	545-570
23	1.85	4.60	98.60	53	0.842	570-592
24	0.57	1.40	100.0	16	0.846	592-615
	40.25	100.0			0.809	

and properties are shown in Table 8. The yield of all products (gasoline, kerosine, and gas oil) amounts to 90 volume per cent of the total vapors leaving the flash zone. Therefore, the gas-oil yield will be 90 − (35.7 + 40.25) = 14.05 volume per cent of the total vapor leaving the flash zone; 35.7 and 40.25 are the volume per cent yields of gasoline and kerosine from Steps 7 and 8.

The properties of the crude oil and distillation products are summarized in Table 9.

The specific gravity of the distillation products is shown in Tables 6, 7, and 8. The corresponding A.P.I. gravities and densities are found from conversion tables such as published in Petroleum Refinery Engineering.[7] The boiling points are assumed to be the midboiling points on the T.B.P. curves shown in Fig. 7. The latent heat of vaporization of the distillation products is approximated from correlations published by Hougen and Watson.[5]

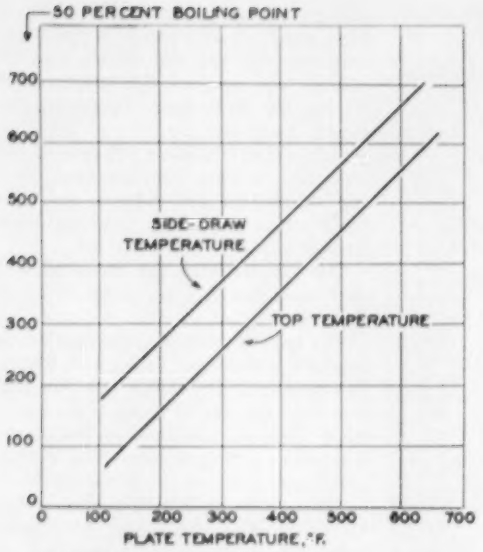
STEP 10—Determine the Gas-Oil Draw Temperature.

This is determined by trial and error since the temperature and effective pressure at the gas-oil draw are both unknown. A gas-oil temperature must be assumed and the induced reflux at the gas-oil draw calculated by a theoretical heat balance.

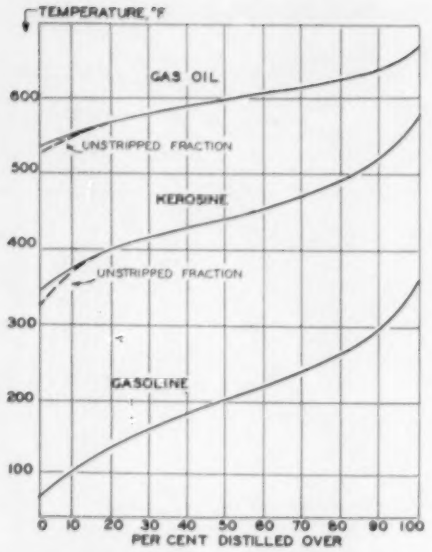
Vapor carriers . . . The steam and low-boiling components that pass the draw plate reduce the effective pressure of the condensable hydrocarbons in the gas-oil boiling range. The components which are at a temperature far above their boiling points behave as vapor carriers and lower the effective pressure just as steam does, but those components which are near their boiling point are not effective in lowering the effective pressure.

Nelson[6] assumes the vapors that will be condensed at the second draw plate above the plate under consideration will act as vapor carriers and the vapors comprising the material that is withdrawn from the first draw plate above will have no effect on the effective pressure. Therefore, at the gas-oil draw the gasoline vapors act as vapor carriers and lower the effective pressure while the kerosine vapors have no effect.

Heat balance . . . From Fig. 8 the temperature of the gas-oil draw plate is about 530° F. Using this temperature the effective pressure at the side-draw plate is determined by a heat balance and checked by a bubble-point calculation. The quantity of induced reflux that is leaving the gas-oil plate is also determined from the heat balance up



APPROXIMATE top and side-draw temperatures in a crude-oil topping tower. Fig. 8.



ESTIMATED A.S.T.M. curves for products. Fig. 9.

to the gas-oil plate shown in Fig. 1. This is summarized in Table 10.

The total pounds per hour of the products are obtained from Table 9. Specific heats and latent heats are obtained from correlations published by Hougen and Watson.[5] The temperatures 625° and 530° F. are flash-zone and gas-oil draw-plate temperatures, respectively.

Overflash . . . This condenses before it reaches the gas-oil plate and is assumed to condense at 550° F. The overflash is defined as that portion of the total vapor leaving the flash zone boiling above the gas-oil boiling range and not included in the gas-oil fraction as shown in Table 13. In commercial operation the residuum usually leaves the bottom of the tower at a temperature lower than the flash-zone temperature. However, the residuum is not cooled by reflux and is not included in the heat balance.

The internal reflux contains the gas-oil fraction; therefore, the gas oil is not considered as a material whose partial pressure is lowered. The moles of material which act as vapor carriers are shown in Table 11.

TABLE 8—COMPOSITION AND PROPERTIES OF GAS-OIL FRACTION

Component	Vol. % of feed	Vol. % of gas oil	Accumulative vol. %	Vol. % of component	Sp. gr.	Boiling range
20	0.43	3.06	3.06	100	0.825	485-515
21	1.02	7.26	10.32	100	0.831	515-545
22	1.02	7.26	17.58	100	0.837	545-570
23	1.65	11.74	29.32	100	0.841	570-592
24	2.93	20.85	50.17	100	0.846	592-615
25	4.00	28.46	78.63	100	0.852	615-650
26	1.88	13.37	92.00	63	0.857	650-675
27	1.12	8.00	100.00	37	0.871	675-705
	14.05	100.0			0.848	

TABLE 9—PROPERTIES OF CRUDE-OIL AND DISTILLATION PRODUCTS

	Vol. %	°A.P.I.	Lb./bbl.	Bbl./hr.	Lb./hr.	B. pt., °F.	Mol. wt.	Latent heat
Gasoline	24.2	62.0	256.1	91	23,305	223	107	132
Kerosine	27.3	43.4	283.9	102	28,897	450	191	102
Gas oil	9.5	35.4	296.9	36	10,688	615	274	85
Reduced crude	39.0	24.2	318.2	146	46,460			
Crude	100.0	38.4	291.6	375	109,350			

TABLE 10—THEORETICAL HEAT BALANCE UP TO THE GAS-OIL PLATE

	Lb./hr.	T_2	T_1	Sp. heat	Latent heat	Total heat
Cool gasoline vapor	23,305	625	530	0.621		1,374,878
Cool kerosine vapor	28,897	625	530	0.616		1,691,052
Cool gas-oil vapor	10,688	625	530	0.608		617,339
Cool overflash	8,040	625	550	0.600		458,280
Cool steam	5,100	625	530	0.500		242,250
Cool reduced-crude liquid						
Condense overflash	8,040				75	603,000
Condense gas oil	10,688				85	908,480
Reflux heat at gas-oil plate						5,895,279

$$\text{Moles internal reflux} = \frac{5{,}895{,}279}{274 \times 85} = 253.13$$

TABLE 11—MOLES OF MATERIAL WHICH ACT AS VAPOR CARRIERS

	Moles/hr.
Steam	283.33
Gasoline	217.73
Kerosine	No effect
Total	501.06

The steam rate to the flash zone is 5,100 lb. per hour or 283.33 moles per hour. The moles of gasoline are obtained from Table 20 excluding the material stripped from the kerosine.

The tower operating pressure at the flash zone is 25 psia. A pressure drop of 1 psia. is assumed between the flash zone and gas-oil draw plate. Then the effective pressure at the gas-oil plate

$$= \frac{253.13}{501.06 + 253.13} \times 24 = 8.06.$$

This effective pressure is verified by the bubble-point calculation shown in Table 12 and is found to be 8.01 psia. This is close to 8.06 psia. calculated from the heat balance, and 8.06 is assumed to be correct. If a satisfactory check is not obtained, a new temperature is assumed and the calculations repeated.

STEP 11—Determine the Minimum Number of Plates for Section 2 of the Tower.

The boundary limits for any separation of crude-oil fractions are represented by the minimum number of plates that would be required if the section of the column were operated at total reflux and the minimum reflux that would be needed if the column contained an infinite number of plates. Commercial units are operated between these limiting conditions.

The feed to Section 2 are the fractions vaporized in the flash zone shown in Table 5. The total vapors leaving Section 2 contain the gasoline, kerosine, and gas oil and are considered as the overhead product. The total liquid leaving the bottom of Section 2 is the overflash, defined in Step 10, or the difference between the feed and overhead product. These are summarized in Table 13.

Key components . . . Since maximum yield of gas oil containing no asphaltic material is desired, Components 26 and 27 are designated as the light and heavy key components, respectively, because Component 27 is the highest-boiling component that can be tolerated in the gas-oil fraction. It is usually not economical to build a column that will control the end point of gas-oil distillate so closely, but the exceptionally close end point control was selected for purposes of illustration.

The minimum number of plates at total reflux is calculated by the familiar Fenske equation.[2]

The equilibrium constants for calculation of α_{LK} are shown in Table 14.

TABLE 14—EQUILIBRIUM CONSTANTS AT TOP AND BOTTOM CONDITIONS OF SECTION 2

Component	K at 625° F. and 15 psia.	K at 530° F. and 8 psia.
26	0.680	0.375
27	0.447	0.275

The equilibrium constants are obtained from Table 13.

Then:

$$\alpha_{LK} = [(0.375/0.275)\ (0.680/0.447)]^{1/2} = 1.44 \qquad (2)$$

$$S_M = \frac{\log\ (0.0114/0.1246)\ (0.2032/0.0644)}{\log 1.44} = 2.9 \text{ theoretical plates} \qquad (1)$$

The values used in calculating S_M are found from Table 13 and Equation 2.

STEP 12—Determine Minimum Reflux With an Infinite Number of Plates for Section 2.

This is determined by the Scheibel-Montross equation.[9] This is Equation 3 given in the "abbreviations." Equations 4, 5, 6, and 7 further define the terms used in the Scheibel-Montross equation.

Note that in Equation 5 in the "abbreviations" the sign of the radical is selected to yield a positive of X_1 between 0 and 1.

The first step is to calculate the various terms used in the minimum reflux ratio equation, Equation 7 in the "abbreviations."

$$R' = \frac{0 - 0.03434}{1.0 - 0.93197} = -0.505 \qquad (7)$$

The values in this equation are obtained from Table 13.

$$P = (1.44 - 1)\ [1 + (-0.505)] \times \frac{0.01720}{0.01720 + 0.01649} = 0.1112 \qquad (6)$$

The values used in calculating P are found from Table 13 and Equations 1, 2, and 7.

TABLE 12—PRESSURE CORRESPONDING TO 530° F. BUBBLE POINT OF GAS OIL

Component	Midboiling point	Moles/hr.	X*	K_π†	$K_\pi X$ (psia.)
20	500	1.53	0.0395	24.0	0.95
21	530	3.19	0.0824	17.1	1.41
22	557	3.18	0.0821	12.7	1.04
23	581	4.76	0.1229	9.5	1.17
24	602	8.21	0.2119	7.4	1.57
25	633	10.51	0.2714	5.0	1.36
26	668	4.70	0.1214	3.0	0.36
27	690	2.65	0.0684	2.2	0.15
		38.73	1.0000		8.01

*X = mole fraction. †π = partial pressure = 8.06 psia.

TABLE 13—TOTAL FEED TO SECTION 2 AND EQUILIBRIUM CONSTANTS OF COMPONENTS AT TOP AND BOTTOM OF THE TOWER

Component	Feed (moles/hr.)	Overhead (moles/hr.)	Bottoms (moles/hr.)	K at 530° F. and 8 psia.	K at 625° F. and 15 psia.
1	16.19	16.19		103.79	67.56
2	16.11	16.11		80.42	57.17
3	15.73	15.73		68.75	50.67
4	15.09	15.09		56.25	43.33
5	21.28	21.28		46.88	36.67
6	20.16	20.16		37.50	30.20
7	19.04	19.04		31.25	24.67
8	18.05	18.05		26.25	20.67
9	17.16	17.16		21.88	18.33
10	19.24	19.24		18.75	15.33
11	15.68	15.68		15.63	13.33
12	17.72	17.72		13.75	11.93
13	19.72	19.72		11.38	10.07
14	13.80	13.80		9.63	8.73
15	17.67	17.67		8.25	7.80
16	16.93	16.93		6.63	6.67
17	16.06	16.06		5.63	5.67
18	19.01	19.01		4.50	4.67
19	14.53	14.53		3.50	3.87
20	16.95	16.95		3.00	3.20
21	15.96	15.96		2.14	2.50
22	12.22	12.22		1.59	1.93
23	10.13	10.13		1.19	1.53
24	9.77	9.77		0.93	1.23
25	10.51	10.51		0.63	0.87
26	7.46	4.70	2.76	0.38	0.68
27	7.15	2.65	4.50	0.28	0.45
28	6.82		6.82	0.15	0.27
29	5.24		5.24	0.07	0.14
30	2.83		2.83	0.01	0.02
	433.66	411.51	22.15		

THE AUTHORS

N. H. PRATER

C. W. BOYD

N. H. Prater received a B.S. in chemical engineering from Georgia Tech in 1951. He has served 2 years in the U. S. Navy. After graduation he joined the technical department of Magnolia Petroleum Co.'s refining division. His work has been primarily in distillation and light-ends handling. He is a native of Birmingham, Ala.

C. W. Boyd graduated in 1954 from Texas A. and M. with a B.S. degree in chemical engineering. He worked with the Magnolia technical department during the summer of 1953 on evaporation losses from gasoline storage tanks. He joined Magnolia on a permanent basis in June 1954, working primarily with light-ends processing.

$$X_i = \frac{0.1112 - 1.44 - (-0.505) \pm ([0.112 - 1.44 - (-0.505)]^2 + 4(-0.505)\,0.1112)^{1/2}}{2(-0.505)\,(1.44 - 1)}$$

$$X_i = \frac{-0.8238 \pm [0.6938 + (-0.2246)]^{1/2}}{-0.4444} = 0.3128 \qquad (5)$$

The values used in calculating X_i are found from Equations 2, 6, and 7.

$$(L/D)_M' = \frac{0.6936}{(1.44 - 1)\,0.3128} - \frac{(1 - 0.6938)\,1.44}{(1 - 0.3128)\,(1.44 - 1)} = 3.2973 \qquad (4)$$

The values used in calculating L/D are found from Equations 2, 5, 6, and 7 in Table 13.

Before $(L/D)_M$ can be calculated, $\frac{X_{DF}}{(\alpha_{LK}/\alpha_D) - 1}$ must be calculated for each component in the feed heavier than Component 27, the heavy key component. In order to determine α_D, the average relative volatility, the equilibrium constants K of the respective components at top and bottom tower conditions must be obtained. These are shown in Table 13.

ponent in the feed lighter than Component 26, the light key component. The respective equilibrium constants for these components are also shown in Table 13.

For Component 1:

$$X_{AF}/\alpha_A\,(1 + \alpha_{LK}/\alpha_A) = \frac{0.03733}{[(103.8/0.28)\,(67.57/0.45)]^{1/2}}\left(1 + \frac{1.44}{[(103.8/0.28)\,(67.56/0.45)]^{1/2}}\right) = 0.0131$$

This value for all other components lighter than the light key component are calculated in the same manner and are summarized in Table 15.

Then:

$$\Sigma\, X_{AF}/\alpha_A\,(1 + \alpha_{LK}/\alpha_A) = 0.08226$$

The values used in calculating the terms shown in Table 15 are also found from Equation 2 and Table 13.

Substitute values for all terms in the minimum reflux ratio Equation 3:

is the induced reflux calculated in Step 10 and 22.15 moles per hour is the overflash or material flowing back to the flash zone as shown in Table 13. The actual reflux ratio, L/D, is (137.64/411.51) = 0.334 where 411.51 moles per hour is the total overhead product from Section 2 (gasoline, kerosine, and gas oil) as shown in Table 13.

STEP 14—Determine the Total Number of Plates for Section 2.

This is determined from the Gilliland correlation[3] where f(S) is plotted against f(L/D).

$$f(S) = \frac{S - S_M}{S + 1} \text{ and } f(L/D) = \frac{L/D - (L/D)_M}{L/D + 1}$$

$$(L/D)_M = \frac{1}{0.01720 + 0.93197}\,[0.01720\,(3.2973) + (0.01649 + 0.03434)\,(0.0133) + 0.08226] = 0.147$$

For Component 28:

$$\frac{X_{DF}}{(\alpha_{LK}/\alpha_D) - 1} = \frac{0.01573}{\frac{1.44}{(0.15/0.28)\,(0.27/0.45)} - 1} = 0.0102$$

For Component 29:

$$\frac{X_{DF}}{(\alpha_{LK}/\alpha_D) - 1} = \frac{0.01208}{\frac{1.44}{(0.07/0.28)\,(0.14/0.45)} - 1} = 0.0029$$

For Component 30:

$$\frac{X_{DF}}{(\alpha_{LK}/\alpha_D) - 1} = \frac{0.00653}{\frac{1.44}{(0.01/0.28)\,(0.02/0.45)} - 1} = 0.0002$$

Then:

$$\Sigma \frac{X_{DF}}{(\alpha_{LK}/\alpha_D) - 1} = 0.0102 + 0.0029 + 0.0002 = 0.0133$$

The values used in the above calculations are found from Equation 2 and Table 13.

Similarly a $X_{AF}/\alpha_A\,(1 + \alpha_{LK}/\alpha_A)$ term must be calculated for each com-

STEP 13—Determine Actual Reflux Ratio in Section Above Flash Zone.

Reflux in a complex-mixture column decreases from tray to tray. The effective reflux is the average of the reflux entering and leaving the section of the column under consideration. Therefore, the reflux for Section 2 of Fig. 1 is (253.13 + 22.15)/2 = 137.64 moles per hour where 253.13 moles per hour

S_M and $(L/D)_M$ were previously calculated in Steps 11 and 12 to be 2.9 and 0.147, respectively. The actual re-

TABLE 15
Summary of $X_{AF}/\alpha_A\,(1 + \alpha_{LK}/\alpha_A)$ Terms for Components Lighter Than the Light Key Component

Component	$X_{AF}/\alpha_A\,(1 + \alpha_{LK}/\alpha_A)$
1	0.00010
2	0.00020
3	0.00022
4	0.00025
5	0.00040
6	0.00050
7	0.00059
8	0.00064
9	0.00072
10	0.00095
11	0.00093
12	0.00114
13	0.00159
14	0.00127
15	0.00191
16	0.00226
17	0.00251
18	0.00378
19	0.00364
20	0.00524
21	0.00684
22	0.00736
23	0.00855
24	0.01109
25	0.01959
Total	0.08226

flux ratio was found to be 0.334 from Step 13. Therefore:

$$(L/D)_M = \frac{0.334 - 0.147}{0.334 + 1} = 0.140$$

From the Gilliland correlation f (S) = 0.49.

Therefore $0.49 = (S - S_M)/(S + 1) = (S - 2.9)/(S + 1)$ and solving for S the theoretical number of plates required is 7.6.

STEP 15—Determine Plate Efficiency in Section 2 of Tower and Actual Number of Plates.

Fractionation efficiency is higher at low pressures than for high-pressure operation. However, in both instances it is a function of the viscosity of the tower feed.

Empirical equation . . . The plate efficiency of any section of a crude-oil topping tower may be estimated by Equation 8, $E = 63\,(\phi)^{-0.212}$ where ϕ is the product of the relative volatility of the key component, α_{LK}, and the viscosity of the feed in centipoises at the average tower section temperature. This empirical equation was developed from plant data by plotting the calculated plate efficiency versus the product of the relative volatility of the key components and the molal viscosity in centipoises.

The average temperature of the section is $(625 + 530)/2 = 572.5°$ F. The viscosity of the feed may be estimated from published correlations if viscosity data are not available.[5] The relative volatility, α_{LK}, was found to be 1.44 from Step 11. The viscosity of the feed at 572.5° F. is 0.288 cp. The plate efficiency is calculated from Equation 8, $E = 63\,(0.288)^{-0.212} = 80$ per cent. The theoretical number of plates from Step 14 was found to be 7.6. Therefore, the actual number of plates required for the separation = 7.6 ÷ 0.80 = 10.

STEP 16—Find the Amount of Material to Be Stripped From the Gas Oil.

Side-stream strippers are used to control the flash point or initial boiling point of the product. Since no specification was set on the flash point or initial boiling point of the gas oil, it is assumed that 3 volume per cent of the gas oil is removed in the stripper. The composition of the material removed and quantity of stripping steam is determined by methods previously published.[8] The steam rate is 270 lb. per hour. The composition of the material removed from the gas oil is shown in Table 16.

TABLE 16
Composition and Volume Per Cent of Material Removed From the Gas Oil by Steam Stripping

Component	Vol. per cent of gas oil	Per cent removed
20	3.06	70
21	7.26	12

This material is added to the total feed entering Section 2 shown in Fig. 1 and included in the final kerosine product as shown in Table 18.

STEP 17—Determine the Kerosine Draw Temperature.

This is determined in the same manner as for the gas-oil draw. From Fig. 8 the temperature of the kerosine draw plate is 410° F. Using this temperature the effective pressure at the side draw plate is determined by a theoretical heat balance and checked by a bubble point calculation. The quantity of induced reflux that is leaving the kerosine plate must also be determined. This is found by making a theoretical heat balance up to the kerosine draw shown in Fig. 1. This calculation is shown in Table 17.

The total pounds per hour of the materials are obtained from Table 9 and Step 16. The specific heats and latent heats are also found from Table 9. The temperatures 625°, 530°, and 410° F. are flash-zone, gas-oil-draw, and kerosine-draw temperatures, respectively.

STEP 18—Determine the Total Number of Plates for Section 3 of the Tower.

This is determined by the same manner as for Section 2 of the tower. The feed, overhead, and bottom products for Section 3 are shown in Table 18. The light and heavy key components in this section are Components 22 and 23, respectively. These were chosen because they lie between the 525° F. at 90 per cent and 600° F. end-point maximum boiling range and will allow control over boiling temperature specifications for the product.

From Tables 10 and 17, the reflux to Section 3 is $(671.95 + 253.13)/2 =$ 462.54 moles per hour. The minimum number of plates at total reflux is 2.72. The theoretical minimum reflux with an infinite number of plates is 0.2026. The actual reflux ratio for the section is (462.54/411.51) = 1.241. The theoretical numbers of plates is found to be three. The efficiency of the plates in Section 3 is 65 per cent. Therefore, the actual number of plates is 3.0 ÷ 0.65 = 5.

TABLE 18
Composition of Feed, Overhead and Bottom Products for Section 3 of the Tower

Component	Moles per hour		
	Feed	Overhead	Bottoms
1	16.19	16.19	....
2	16.11	16.11	....
3	15.73	15.73	....
4	15.09	15.09	....
5	21.28	21.28	....
6	20.16	20.16	....
7	19.04	19.04	....
8	18.05	18.05	....
9	17.16	17.16	....
10	19.24	19.24	....
11	15.68	15.68	....
12	17.72	17.72	....
13	19.17	19.17	....
14	13.80	13.80	....
15	17.67	16.67	....
16	16.93	16.93	....
17	16.06	16.06	....
18	19.01	19.01	....
19	14.53	14.53	....
20	16.95	15.42	1.53
21	15.96	12.77	3.19
22	12.22	9.04	3.18
23	10.13	5.37	4.76
24	9.77	1.56	8.21
25	10.51	....	10.51
26	4.70	....	4.70
27	2.65	....	2.65
	411.51	372.78	38.73

STEP 19—Find the Amount of Material to Be Stripped From the Kerosine.

The flash point of the unstripped kerosine fraction shown in Fig. 9 can be estimated from correlations published by Van Winkle[12] and is found to be 123° F. A portion of the low-boiling components must be removed by steam stripping to produce the desired flash-point specification of 135°

TABLE 17—THEORETICAL HEAT BALANCE UP TO THE KEROSINE PLATE

	Lb./hr.	T_2	T_1	Sp. heat	Latent heat	Total heat
Cool gasoline vapor	23,305	625	410	0.621	....	3,111,218
Cool kerosine vapor	28,897	625	410	0.621	....	3,825,963
Cool gas-oil vapor	10,688	625	530	0.608	....	617,318
Cool overflash	8,040	625	550	0.600	....	458,280
Cool stripped material	338	530	410	0.610	....	24,742
Cool tower steam	5,100	625	410	0.500	....	548,250
Cool gas-oil stripping steam	270	530	410	0.500	....	16,200
Condense kerosine	28,897	....	....	....	102	2,947,494
Condense gas oil	10,688	....	....	....	85	908,480
Condense overflash	8,040	....	....	....	75	603,000
Condense stripped material	338	....	....	....	89	30,082
Reflux heat at kerosine plate					....	13,091,027

$$\text{Moles internal reflux} = \frac{13{,}091{,}027}{191 \times 102} = 671.95$$

F. The composition removed and quantity of stripping steam are determined in the same manner as for the gas oil shown in Step 10. The steam rate is 1,304 lb. per hour. The composition of the material removed from the kerosine fraction is shown in Table 19.

TABLE 19
Composition and Volume Per Cent of Material Removed From the Kerosine Fraction by Steam Stripping

Component	Vol. per cent of kerosine	Per cent removed
10	0.89	100.0
11	3.03	93.0
12	7.28	26.0

This material is added to the total feed entering Section 4 of Fig. 1 and will be included in the gasoline distillate as shown in Table 22.

STEP 20—Determine the Tower Top Temperature.

This is determined in a similar manner as shown in Steps 10 and 17 for the gas-oil and kerosine-draw plates. From Fig. 8 the tower top temperature is about 270° F. Using this temperature the effective pressure at the tower top (Section 4) is determined by a theoretical heat balance and checked by a dew-point calculation. The quantity of induced or hot reflux at the top plate of the tower must be determined. This is found by making a theoretical heat balance up to the tower top shown in Fig. 1. This calculation is shown in Table 20.

The total pounds per hour of the materials shown in Table 20 are obtained from Tables 9 and 17 and Steps 16 and 19. The temperatures 625°, 530°, 410°, and 270° F. are flash-zone, gas-oil-draw, kerosine-draw, and tower-top temperatures, respectively.

STEP 21—Determine the Total Number of Plates for Section 4 of the Tower.

This is determined in the same manner as for Sections 2 and 3. The feed, overhead and bottom products for Section 4 are shown in Table 22. The light and heavy components in this section are Components 15 and 16, respectively. These were chosen to allow close control of the gasoline end point since components boiling above Component 16 cannot be tolerated in the gasoline fraction.

From Tables 17 and 20 the reflux for Section 4 is (1,117.55 + 671.95)/2 = 894.75 moles per hour. The minimum number of plates at total reflux is 2.96. The theoretical minimum reflux with an infinite number of plates is 0.658. The actual reflux ratio for the section is (894.75/226.16) = 3.95. The theoretical number of plates is found to be 3.11. The efficiency of the plates in Section 4 is 62 per cent. Therefore, the actual number of plates is 3.11 ÷ 0.62 = 6.

The T.B.P. curves of the gasoline, kerosine, and gas oil are converted to A.S.T.M. curves by correlations published by Edmister[1] and are shown before and after steam stripping in Fig. 9. The properties of final products are summarized in Table 21.

These yields and properties have been corrected for the effects of steam stripping and represent the final products. The products meet all specifications.

The information developed by the proposed method of multidraw tower design can be used in economic studies of optimum design, studies involving the relationship of the variables on separation of oil streams, checking tower efficiencies and as a means of designing new fractionation systems.

TABLE 20—THEORETICAL HEAT BALANCE UP TO THE TOP OF THE TOWER

	Lb./hr.	T_2	T_1	Sp. heat	Latent heat	Total heat
Cool gasoline vapor	23,305	625	270	0.621		5,138,753
Cool kerosine vapor	28,897	625	410	0.616		3,825,963
Cool gas-oil vapor	10,688	625	530	0.608		617,318
Cool overflash	8,040	625	550	0.600		458,280
Cool material stripped from gas oil	338	530	410	0.610		24,742
Cool material stripped from kerosine	1,094	410	270	0.618		94,631
Cool tower steam	5,100	625	270	0.500		905,250
Cool gas-oil stripping steam	270	530	270	0.500		35,100
Cool kerosine stripping steam	1,304	410	270	0.500		91,280
Condense kerosine	28,987				102	2,947,494
Condense gas oil	10,688				85	908,480
Condense overflash	8,040				75	603,000
Condense material stripped from gas oil	338				89	30,082
Condense material stripped from kerosine	1,094				95	103,930
Reflux heat at tower top						15,784,303

$$\text{Moles internal reflux} = \frac{15{,}784{,}303}{107 \times 132} = 1{,}117.55$$

TABLE 21—PROPERTIES OF FINAL PRODUCTS

	Gasoline	Kerosine	Gas oil
Yield, volume per cent of crude	25.4	26.4	9.2
Gravity, °A.P.I.	61.9	43.3	35.2
Flash point, °F.		135	
A.S.T.M. 90 per cent point, °F.	310	527	645
A.S.T.M. end point, °F.	370	585	675

TABLE 22
Composition of Feed, Overhead and Bottom Products for Section 4 of the Tower

	Moles per hour		
Component	Feed	Overhead	Bottoms
1	16.19	16.19	
2	16.11	16.11	
3	15.73	15.73	
4	15.09	15.09	
5	21.28	21.28	
6	20.16	20.16	
7	19.04	19.04	
8	18.05	18.05	
9	17.16	17.16	
10	19.24	‡19.24	1.91
11	15.68	§15.38	4.55
12	17.72	¶11.31	8.68
13	19.17	8.24	10.93
14	13.80	6.90	6.90
15	17.67	4.42	13.25
16	16.93	1.86	15.07
17	16.06		16.06
18	19.01		19.01
19	14.53		14.53
20	*16.57		16.57
21	†13.15		13.15
22	9.04		9.04
23	5.37		5.37
24	1.56		1.56
	374.31	226.16	156.58

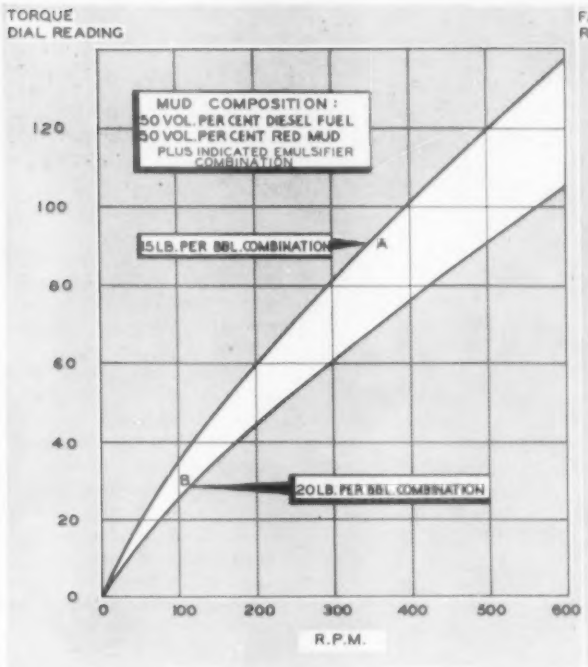
*Contains 1.15 moles per hour stripped from gas oil. †Contains 0.38 moles per hour stripped from gas oil. ‡Contains 1.91 moles per hour stripped from kerosine. §Contains 4.25 moles per hour stripped from kerosine. ¶Contains 2.27 moles per hour stripped from kerosine.

Acknowledgment

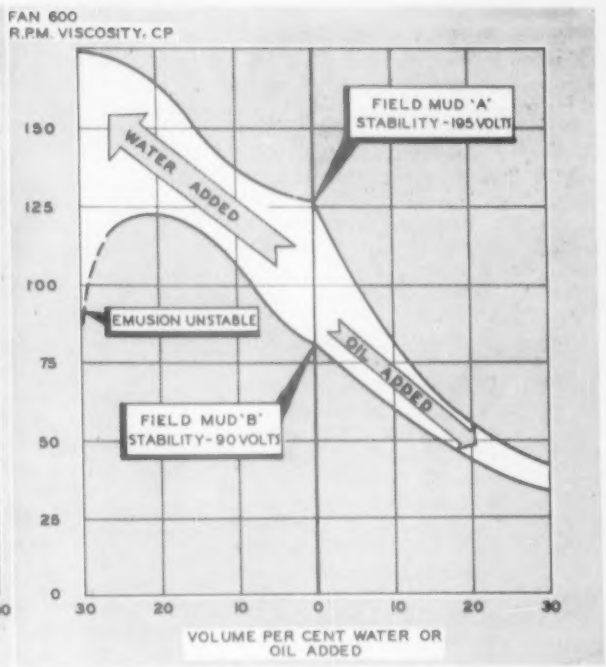
The authors are indebted to Magnolia Petroleum Co. for permission to publish this article and to V. A. Kalichevsky for his helpful criticism and suggestions.

References

1. Edmiston, W. C., and Pollock, D. H., Chem. Eng. Progress, 44, 905 (1948).
2. Fenske, M. R., Ind. Eng. Chem., 24, 482 (1932).
3. Gilliland, E. R., Ind. Eng. Chem., 32, 1220 (1940).
4. Hougen, O. A., and Watson, K. M., "Chemical Process Principles," P-622, John Wiley & Sons, New York (1949).
5. Hougen, O. A., and Watson, K. M., "Chemical Process Principles," P-332-7, John Wiley & Sons, New York (1949).
6. Nelson, W. L., "Petroleum Refinery Engineering," P-421, McGraw-Hill Book Co., Inc., New York (1949).
7. Nelson, W. L., "Petroleum Refinery Engineering," P-789-92, McGraw-Hill Book Co., Inc., New York (1949).
8. Prater, N. H., Pet. Refiner, 33, No. 2, 96-98 (1954).
9. Scheibel, E. G., and Montross, C. F., Ind. Eng. Chem., 38, 268 (1946).
10. Smith, K. A., and Smith, R. B., Pet. Processing (1949).
11. Smith, R. L., and Watson, K. M., Ind. Eng. Chem., 29, 1908-14 (1937).
12. Van Winkle, M., Pet. Refiner, 33, No. 11, 171-3 (1954).
13. Winn, F. W., Pet. Refiner, 33, No. 6, 131-5 (1954).



FLOW PROPERTIES of laboratory-prepared water-in-oil emulsion muds. Fig. 1.



EFFECT OF OIL or water on viscosities of inverted emulsion muds. Fig. 2.

Here's a mud that doesn't plug those dirty sands

Development and Application of a

Water-in-Oil Emulsion Drilling Mud

by M. D. Nelson, B. C. Crittendon, and G. A. Trimble

Magnolia Petroleum has made an inverted emulsion mud that can be used under almost all drilling conditions. It is composed of emulsifiers, any water-base mud, and a refined oil or stabilized crude. Field control of the mud is simple. It is based on measurements of viscosity, filter loss, and emulsion stability. Moreover, a simple method of measuring the stability of the emulsion has also been developed. Already the mud has been used in the field 75 times. It has been used to drill into pay formations, core, complete, and work over. Compared to water-base muds, the new emulsion has given much better results in sands. The authors claim that this mud system has economic and operational advantages over any other oil-base system.

WITH the oil-base muds and water-in-oil emulsions muds up to now, there have been one or more of these objections to each of them:

1. Unsatisfactory at very high temperatures.
2. Unduly affected by contaminants.
3. Extremely dirty to handle.
4. Too expensive.

Therefore, Magnolia Petroleum Co. undertook to develop an inverted emulsion drilling fluid which did not have any of these objectionable points.

What they are . . . Oil-base drilling fluids are, in the simplest sense, a means of avoiding use of water in the bore hole of a well. The filtrate from a water-base mud may cause clays in the formation to swell and disperse. Consequently there is severe damage to well productivity. In zones of low permeability, greatly increased water saturation around the bore hole may be hard to displace by oil. The result is a decrease in or loss of ability of the well to produce oil. In many instances a formation of proved productivity that has been exposed to water or water-base mud is greatly decreased in production, or, in some cases, completely lost.

Such formations are, characteristically, composed of argillaceous sand. Formations of lowest permeability are most susceptible to damage. Formations of this type offer the greatest promise for use of oil-base fluids.

The authors are with Magnolia Petroleum Co., at Dallas, Midland, and Oklahoma City, respectively. Paper presented at spring meeting of Mid-Continent District, A.P.I. Division of Production, Amarillo.

Oil alone is obviously the simplest of the oil-base drilling fluids. It is used extensively, usually in the form of a stabilized crude, in completion and workover. It is used less frequently in drilling because it does not suspend cuttings or weighting material. Moreover, it does not form a filter cake on the wall of the bore hole to restrict loss of fluid into permeable formations. Essentially all modifications of this simplest oil-base system have been toward getting satisfactory suspending and filtration characteristics.

Modifications of the simple oil system have followed two general lines. The first is treatment to give suspending properties and addition of filter-cake-forming materials. These systems, which contain little or no water, are usually referred to as "oil-base muds." They are in widespread but not intensive use. The second direction involves emulsification of large volumes of water or water-base mud in the oil. The emulsion may raise yield value enough to suspend solids. The emulsified water, together with suspended solids, forms a filter cake which may have very low permeability to both oil and water.

Developing a Water-in-Oil Emulsion Mud

Magnolia undertook to develop an oil-base mud system with those formations in mind which are subject to severe productivity damage during drilling in and completion. More specifically, the formations of interest were the so-called "dirty" sands, or sands which contain clay minerals, particularly those of low-permeability where damage is most evident.

After considering this problem these specifications and performance standards were established:

1. A water-in-oil emulsion which could be compounded from any conventional water-base mud by use of oil and emulsifiers.

2. Conversion of the system should be easily and readily made under field conditions.

3. The system should not be unduly affected by reasonable amounts of the usual contaminants during drilling and completion, viz., shale, salt, anhydrite, water-base mud, crude oil, or water.

4. The mud should be able to suspend weighting material to obtain the usual range of mud densities.

5. The mud should have zero, or essentially zero, filter loss. Any filtrate should consist entirely of oil, and the mud should retain good filtration performance to at least 300° F.

6. The cost of the mud should be as low as possible.

In addition to these primary requirements, there were other factors. These included simplicity of composition and required formulation and maintenance procedures, the desirability of precombining all emulsifiers and mud additives, and the safety and cleanliness characteristics of working with the system.

Many commercially available emulsifiers and laboratory modifications of these emulsifiers were screened, singly and in combination. The most promising of these were selected for further study. An early conclusion was that no single emulsifier, by itself, appeared capable of producing the emulsion characteristics desired.

One mud composition was chosen for initial field trials. It used a combination of anionic emulsifying agents, the calcium salts of which were formed in situ to provide the proper type of emulsification. This mud would contain approximately 50 per cent by volume of diesel or crude oil and 50 per cent of any water-base mud. The basic mud system, as first utilized, normally required supplemental treatment. Nature of this treatment would be determined by temperature conditions.

This first mud system conformed, in general, with the predetermined requirements. It could be easily prepared from conventional water-base muds. It showed excellent filter-loss characteristics, and exhibited good resistance to contamination. However, the complex treating was a disadvantage. So was the cost of $3 to $4 per barrel for emulsifiers and supplemental treatment.

The flow properties of this mud system are different from those of the conventional water-base mud. The latter is a plastic system whose rheological nature is best expressed by values for yield point and plastic viscosity. This inverted system on the other hand is essentially pseudo-plastic, and a 2-point viscosity determination, as by the Fann two-speed rotational viscometer, will indicate a false yield value. Examination of the complete shear rate-shearing stress curve (Fig. 1) will verify the pseudo-plastic nature of the system. Departure of this curve from linearity is probably caused by the deformability and freedom to rotate (under shearing stress) of the dispersed water droplets.

The viscosity or other characteristics of this mud system are not drastically changed by additions of either oil or water. However, the most convenient method of decreasing viscosity is by addition of oil. Conversely, viscosity may be increased by addition of water or water-base mud. Typical viscosity reactions of two field mud systems to addition of oil and water are shown in Fig. 2.

In preparation for field test work involving well completions in argillaceous sandstone formations of Pennsylvanian age, outcrop specimens of Pennsylvanian sandstone were utilized in the following test procedure:

1. One-inch sandstone plugs were saturated with synthetic formation water and then flushed with oil to equilibrium water saturation and permeability to oil.

2. These plugs were contaminated with:

(a) A conventional oil-in-water emulsion completion mud obtained from the area of the projected field test.

(b) The inverted emulsion mud prepared from mud a.

3. The contaminated plugs were backflushed with oil to equilibrium flow rate, and the fractional recoveries of original permeability to oil were calculated. Approximately one-tenth of original permeability was recovered in the case of mud a; for mud b, approximately two-thirds of original permeability was recovered.

Further and more extensive laboratory test work has demonstrated that this mud system caused remarkably little permanent damage to effective oil permeability when used to drill into a large block of sandstone outcrop. In this respect it was superior to any of the considerable number of conventional muds examined by the same technique. Included in this examination was one oil-base mud. It is worthy of note that, in these tests, filter-cake formation within the test sample had been relatively restricted in the case of the inverted emulsion mud. Also, backflushing removed all but traces of this invaded material, leaving very minor obstruction to the flow of oil.

Then, a field trial of the inverted mud system was made. A difficult dual completion in argillaceous sands of low permeability was involved. There had been extreme difficulties when completing with water-base muds. The trial was a success. Further development of the mud system was carried on in field operations. Approximately 75 field applications have been made since this initial trial.

There have been many modifications of this first mud system. Definite improvements have been made in performance and control. At this writing, a formulation is in sight which would be even better for general usage.

More was needed besides screening emulsifiers and development and field control of the "inverted"* emulsion-mud system. It was an adequate method of measuring emulsion stability. This measurement was made by means of a probe assembly placed in the sample

*In usual oil-field terminology, an "emulsion" mud refers to the commonly used oil-in-water type of system. An "inverted" emulsion mud implies the reverse type of system, viz., the water-in-oil emulsion in which oil is the continuous phase.

and carrying two silver strip electrodes separated by a ⅛-in. gap.† An increasing alternating-current potential was impressed across the electrodes until emulsion breakdown occurred, as evidenced by initial current flow. These test units have been designed to operate either from 110-volt a.c. power or from a 6-volt storage battery, and are used for all control work with these systems.

When tested with this unit, systems with water as the continuous phase show zero volts stability, or simply zero stability. A water-in-oil emulsion requires some fairly definite voltage to initiate current flow, and this voltage may vary from a very low value to several hundred volts. An arbitrary stability of 100 (volts) was chosen as the minimum satisfactory for a field mud system. Values as high as 1,000 have been noted in both laboratory-prepared samples and field mud systems.

Initial Field Application

The first field application of this inverted emulsion mud was made in Oklahoma. The operation involved a dual completion in the Springer and Hart formations. Previous experience in this field had indicated that the productivity of these formations was severely damaged by contact with water-base mud, acid, or brine. In several instances, completion attempts had failed even after earlier tests had indicated potential production of several hundred barrels per day.

In this operation, the well was drilled to bottom with a fresh-water, oil-in-water emulsion mud as had been customary field practice. The hole was then cased to bottom and cemented. The mud was then displaced with inverted emulsion mud prepared from a portion of the original system.

The new mud was prepared by emptying and cleaning a steel mud pit, filling the pit one-half full of diesel oil, adding emulsifiers to the oil, and then adding water-base mud through the mud guns until the pit was full. Gunning was continued until the emulsion was uniform, after which the mud was displaced down the hole. This process was repeated until returns of the inverted system were obtained at the flow line. Diesel oil was used because only a highly volatile crude oil was available. However, this crude oil was used in bringing the system up to final volume and in later maintenance.

The Springer sand was then perforated and tested. No fracturing or other treatment was required. In attempting to pull the packer preparatory to setting a bridge plug above the Springer, mechanical difficulties were encountered and approximately 3 weeks elapsed before the operation was completed. After the bridge plug was set, two Hart zones were perforated, tested, fractured, and retested. Bridge plugs were then drilled, production tubing was run, the mud was displaced with oil, and the well was dually completed. Twenty-four-hour corporation commission completion tests were 140 bbl. per day on 12/64-in. choke from the Hart and 232 bbl. per day from the Springer on 16/64-in. choke. A more complete report and analysis of production data will be discussed later.

In this completion operation, it was noteworthy that flowing production was established with a minimum of swabbing. Also, although the lower (Springer) zone was in contact with the completion mud for approximately 1 month between perforation and final completion, there was no apparent damage to productivity.

Although this mud system was still in the developmental stage, it was adopted as standard completion practice for dual completions and workover operations in certain areas of Oklahoma. In these areas the inverted emulsion systems has been used in approximately 50 field operations, with applications, in general, being limited to those instances in which crude oil did not provide sufficient hydrostatic pressure to control formation fluids. As many as 10 separate systems have been in use at one time in this locality, employed variously in drilling, coring, completion, and workover operations. In addition to Oklahoma, other applications of this mud system have been made in West Texas and in western Canada.

Extended Field Work

Because of the scope of field experience with this mud system, no attempt will be made to describe each specific operation. Instead, types of operations will be presented, and comparative data will be included where such are available.

● **Well completions in dirty sands . . .** Specific data are available from two areas in which the inverted emulsion mud has been utilized for completions in so-called dirty sands.

1. Northeast Purdy Field, Garvin County, Oklahoma

These wells were dual completions in the Springer and Hart formations. Standardized practice involved drilling to bottom with conventional emulsion mud, cementing casing to bottom, and converting to inverted emulsion mud for perforating, fracturing, and testing. Completion data from the first four wells in which this mud was utilized, together with similar data from offset wells completed with water-base mud, are indicated in Table 1.

Flowing-pressure data are not available on all of the indicated offset wells. However, flowing pressures have been very appreciably higher for wells completed with the inverted emulsion system as compared to wells completed with water-base mud, with improvements noted for both the Hart and Springer zones. Time saved during completion has been a significant factor. As stated by one production foreman, wells completed with this mud system "bounced in like a rubber ball," requiring very little swabbing and demonstrating very quick cleanup. These wells have been, without exception, "good" wells, whereas wells completed with water-base mud have been very erratic, frequently showing severe damage to, or loss of, productivity.

This latter condition is demonstrated by certain other experience in this field.

TABLE 1—COMPLETION DATA FROM NORTHEAST PURDY FIELD

		Hart sand comp.			Springer sand comp.		
Ref. well inverted emulsion mud	Offset water-base mud	Choke, 1/64 in.	C.C.* potential, bbl. per day	Casing pressure, psi.	Choke, 1/64 in.	C.C.* potential, bbl. per day	Tubing pressure, psi.
No. 1		12	140	775	16	232	500
	South	8	89	150	11	101	500
	West	16	296	550	16	285	450
	North	16	107	475	16	261	
	Northeast	16	43	200	16	32	
No. 2		8	142	1,050	20	668	375
	South	16	296	550	16	285	450
	North	11	92		14	209	
	Northeast	9	70	650	14	137	450
	East	16	107	475	16	261	
No. 3		24	438	350	24	558	450
	Northeast	11	92	500	14	209	
	Southeast	16	296	550	16	285	450
No. 4		18	323	525	28	458	150
	Northeast	16	109	675	16	243	200
	East	16	140	275	No recovery after treatment.		

*Corporation Commission.

†Patent applied for.

For example, two wells, tested from the Springer on 32/64-in. choke, flowed 501 and 509 bbl. per day, respectively. After being exposed, in one case to salt water and in the other to water-base mud, these two wells were completed for 11 and 19 bbl. per day from the Springer. In other instances, Springer production has apparently been lost completely during testing of a higher zone. Further data on these cases will be presented in describing workover operations.

2. Jameson-Strawn Field, Coke County, Texas

Completion data are available for one local operation in the Jameson-Strawn field involving seven wells drilled and completed with water-base mud and five wells completed with inverted emulsion mud. In using the inverted emulsion, three methods were utilized: (1) hole was drilled to bottom with water-base mud, casing was set to bottom, and mud was displaced by inverted emulsion; (2) the water-base mud was displaced by inverted emulsion mud in open hole above the producing formation, the well being then drilled and casing cemented to bottom; (3) casing was set above the productive sand, the producing formation was then drilled with the inverted emulsion, and liner was set to bottom prior to completion. The latter method appears to be desirable from the standpoint of convenience of operations. However, no appreciable difference in completion data was noted between these three variations of method.

The formation involved in the foregoing operations was believed to be relatively uniform, and, other factors being equal, little variation should have been anticipated in completion tests. Specific completion data are as shown in Table 2.

TABLE 2—JAMESON-STRAWN FIELD COMPLETION DATA

Well No.	Completion mud—	P.R.C.* 24-hour potential, bbl. per day	Choke, 1/64 in.	Tubing press., psi.
1	Water-base	176	11	650
2	Water-base	213	13	700
3	Water-base	150	12	860
4	Water-base	167	13	720
5	Water-base	156	11	750
6	Water-base	164	14	380
7	Water-base	145	13	550
8	Inverted emulsion	197	10	1,020
9	Inverted emulsion	212	10	1,075
10	Inverted emulsion	166	9	1,325
11	Inverted emulsion	135	9	1,050
12	Inverted emulsion	142	9	1,025

*Railroad Commission.

Production data from these wells subsequent to completion are not available. It is planned to observe these wells in order to determine the long-term effects on productivity.

Attention is called to a practice which has been mentioned previously. In many instances, wells have been drilled to bottom with conventional water-base or oil-in-water emulsion muds. Electric logs have been obtained, with casing then being set to bottom through the potential producing formations. The mud is then converted to, or replaced by, inverted emulsion mud, and completion operations thereafter avoid the use of an aqueous fluid. This practice permits the use of all available logging tools and relies on perforating and fracturing procedures to penetrate the formation through or beyond the zone seriously damaged by water-base mud. The oil-base fluid prevents serious damage to the productive capacity of the newly exposed formation in perforations and fractures.

The foregoing practice represents a compromise for the purpose of obtaining electric logs, and may be desirable in many operations. However, maximum benefit can be obtained from the inverted mulsion by using it, also, for drilling into and coring the potentially productive sands.

● **Limestone completions . . .** The inverted emulsion mud has been utilized in drilling and completion operations in two wells where the producing formation was limestone or dolomite. The formations were acidized after being exposed to the mud. Completion data did not warrant further use of this mud system in these operations.

It is believed that the use of an aqueous fluid (acid, in the foregoing case) in the hole after exposure to inverted emulsion may more than counteract the possible advantages accruing from the use of the mud. There is a strong possibility that acid would be emulsified in mud and mud filtrate, forming a viscous emulsion within the formation with possible severe damage to well productivity. This experience verifies the basic idea that the inverted emulsion (or other oil-base mud) is utilized primarily as a means of protecting the formation from contact with water. If water, acid, or other aqueous fluid is subsequently permitted to contact the formation, the value of the emulsion-mud usage may be obscured or lost, or its use may even be detrimental.

● **Drilling characteristics . . .** This inverted emulsion mud has been used for drilling in about 30 different operations. In most instances, it was used only for drilling the potential producing formation or formations. However, it has been used on each of four occasions to drill approximately 2,000 ft. of hole. Drilling has been to a maximum depth of about 12,000 ft. and at temperatures up to 275° F. During these operations the following characteristics have become evident.

1. Hole Characteristics

When water-base mud is displaced by inverted emulsion mud in open hole, water-base filter cake is removed from the hole. In the words of one observer, "The old mud cake comes out like pieces of inner tube." It is, for the most part, removed on the shale shaker and may produce some congestion at that point. The hole is cleaned up with a circulation or two of the mud.

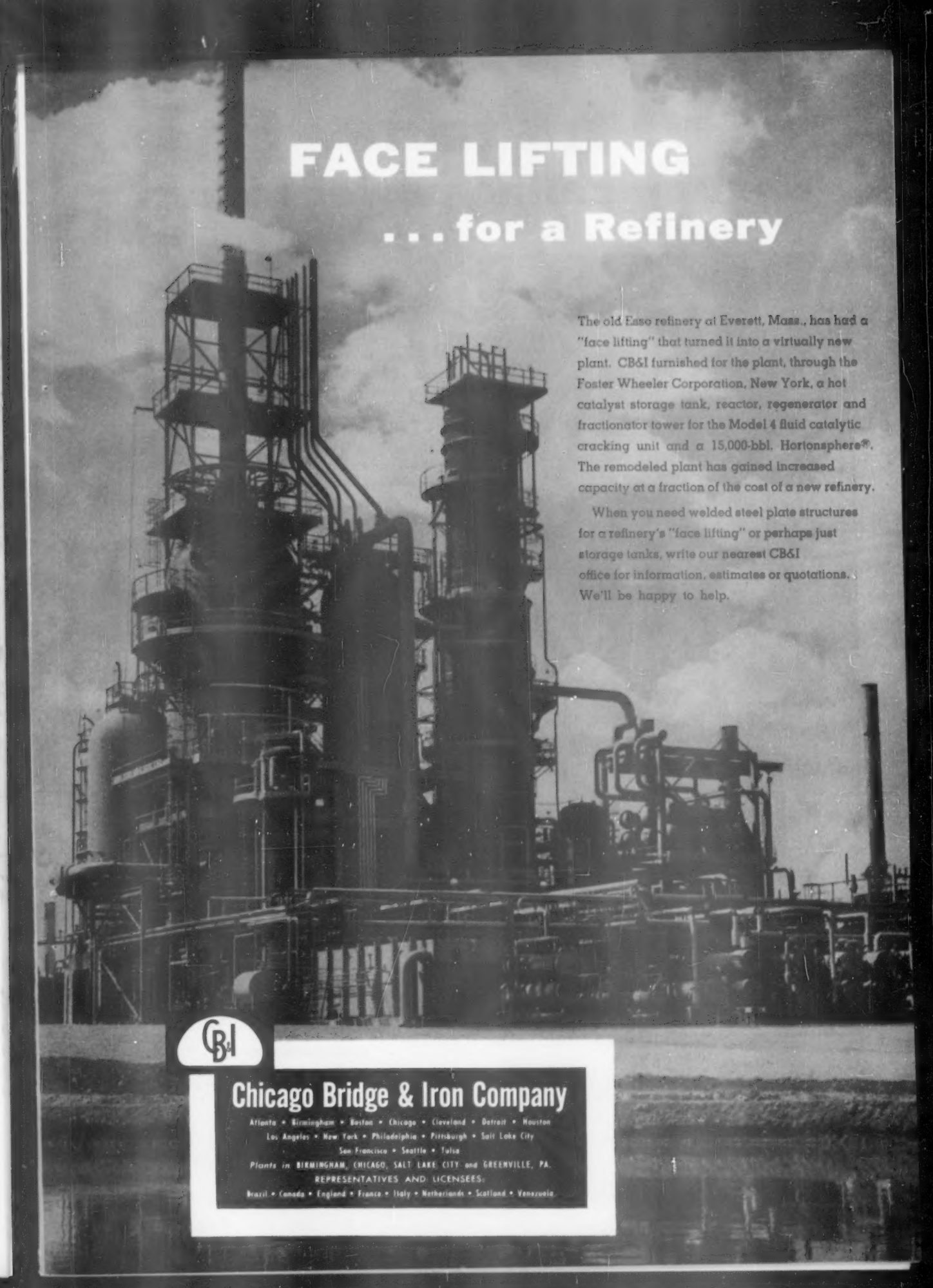
The mud has low gel strengths and must rely on a relatively high plastic viscosity and mud velocity for its ability to suspend and lift cuttings. This may partly explain difficulties experienced in cleaning up holes in which shales tended to slough, forming large cavities around the drill pipe. Water-base mud of adequate gel strength used in such circumstances could become gelled in the cavities, with flow limited to channels through the gelled mass. Thus, mud velocities would remain high enough to lift cuttings and shale. In the emulsion mud, cuttings would simply percolate in the entire washed-out section, and would fall into the hole when circulation was stopped. Such difficulty has been experienced only in hole which had been drilled with, or exposed to, water or water-base mud.

In view of the reported condition that large quantities of shale are frequently removed from a hole when a water-base fluid is displaced by one in which oil is the continuous phase, a supplemental or alternative explanation of such difficulty is that shales which have been penetrated, swollen, and loosened by water or filtrate from a water-base mud are easily dispersed into an inverted emulsion (or other oil-base) system. It appears that hole which has become unstable by contact with an aqueous fluid may slough badly on later contact with an oil-base fluid.

Hole drilled with the mud has been extremely close to gage, as indicated by caliper logs.

2. Drilling Rate

In every application in a new area of operations, drilling rates, particularly in shale, were found to be appreciably slower than with water-base mud. This had been expected inasmuch as the continuous phase would not wet, penetrate, and soften water-wet shales. However, in the area where the major portion of drilling with this mud has been done (Oklahoma), it is now reported that maintenance of high fluid velocities



FACE LIFTING

. . . for a Refinery

The old Esso refinery at Everett, Mass., has had a "face lifting" that turned it into a virtually new plant. CB&I furnished for the plant, through the Foster Wheeler Corporation, New York, a hot catalyst storage tank, reactor, regenerator and fractionator tower for the Model 4 fluid catalytic cracking unit and a 15,000-bbl. Hortonsphere®. The remodeled plant has gained increased capacity at a fraction of the cost of a new refinery.

When you need welded steel plate structures for a refinery's "face lifting" or perhaps just storage tanks, write our nearest CB&I office for information, estimates or quotations. We'll be happy to help.

CB&I

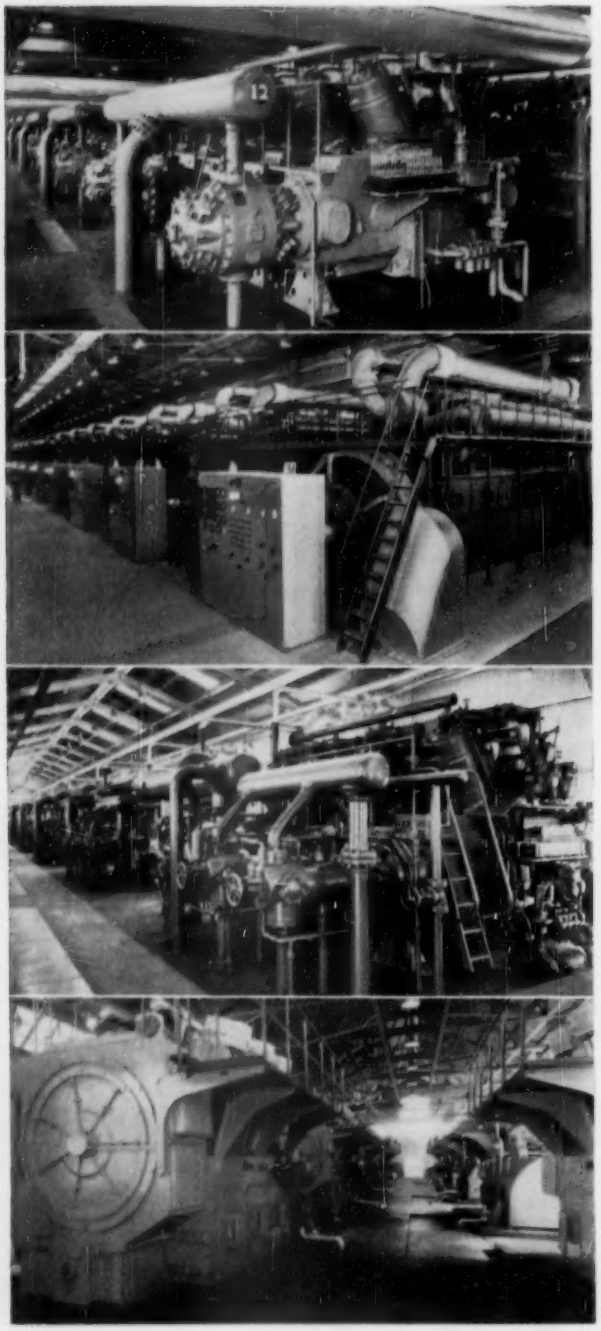
Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
Los Angeles • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • Tulsa

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY *and* GREENVILLE, PA.

REPRESENTATIVES AND LICENSEES:
Brazil • Canada • England • France • Italy • Netherlands • Scotland • Venezuela

THE TRUTH about pipeline power today!



OVER $200,000,000 worth of Cooper-Bessemer gas engine driven compressors are pumping gas today.

This totals more than 4,000 units, on over *forty* of the country's largest gas transmission lines.

Hundreds of these units have been in continuous operation not for just one year, not five years, but many for over *forty* years!

Cooper-Bessemer reciprocating compressors have been improved every year since 1910 . . . fuel consumption lowered, reliability improved, availability bettered and maintenance costs reduced. That's why every year sees more Cooper-Bessemers installed to serve the expanding gas line industry!

All this *because* . . .

1. A gas transmission company is its own biggest customer . . . and these modern gas engine units operate on 25 to 35% less fuel than a direct fired gas turbine.

2. Nothing equals experience! The efficiency, reliability and economy of Cooper-Bessemer reciprocating compressors is the reason why gas companies who use them *continue* to use them.

3. The total installed cost of a reciprocating compressor is just as low as that of a direct fired gas turbine.

4. Maintenance cost on a gas pipe line is not measured by the experience of the first year, or by the second year, but over the full life of the project. There are hundreds of records to prove you just can't beat the long-range maintenance economy of Cooper-Bessemers.

If it's your money going into a new gas pipe line project, or any other heavy-duty power application for that matter, you'll be wise to ask if Cooper-Bessemer engines or compressors are to furnish the power.

MOUNT VERNON, OHIO

COOPER-BESSEMER

GROVE CITY, PENNA.

New York City • Seattle, Wash. • Bradford, Pa. • Chicago, Ill. Houston, Dallas, Greggton, Pampa and Odessa, Texas Washington, D. C. • Shreveport, La. • San Francisco, Los Angeles, Calif. • St. Louis, Mo. • Gloucester, Mass. • New Orleans, La. • Tulsa, Okla. • Cooper-Bessemer of Canada Ltd., Edmonton, Alberta—Halifax, Nova Scotia.

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS

permits drilling rates similar to those possible with water-base mud. Increased mud velocity is attained by use of larger fluid courses in the bit, lower mud viscosity, and increased pump pressures. It is evident that optimum drilling conditions with an oil-base system are not yet completely understood and that some development and standardization in drilling technology are desirable. Drilling rates in sand have been relatively good. Bit life has been noticeably improved as a result of better lubrication of bearing and cutting surfaces, with resultant increased time on bottom.

3. Coring

This mud has been very successful in diamond coring sand sections. Core recoveries have been very high, showing particular improvement in zones where the sand tends to crumble on contact with fresh water. There has been nothing to distinguish coring rates from those obtained with water-base muds. In common with other oil-base systems, this mud has provided cores which have not been flushed with an aqueous filtrate and from which it is believed reliable values for interstitial-water content could be determined.

Workover operations . . . The mud has been used in a number of workover operations. In an instance of this usage in Chitwood field, Oklahoma, it was necessary to kill a producing well in order to dual-complete in a higher zone. Based on experience in this field, it was believed that placement of water-base mud against the lower zone would result in permanent loss of production from that zone. Production from the lower zone was killed by placing inverted emulsion mud in the hole. The lower zone was isolated by a bridge plug, and the upper zone was perforated, fractured, and tested. The bridge plug was drilled out and the well was dually completed. The upper zone tested well and at latest report was making its maximum allowable of 168 bbl. per day. Prior to workover conditions, the lower zone was making 50 bbl. per day, at capacity.

On recompletion, production was somewhat higher, and had dropped only to 57 bbl. per day 45 days after recompletion. After several months, production in December 1954 from this zone averaged 102.5 bbl. per day. There is evidence in this case of positive long-term cleanup action after exposure to the inverted emulsion mud, although variation in production practices may have played a minor role in this increase. It is also possible that the present gas-recycling program may have some effect on this improved production.

TABLE 3—RECOMPLETION OPERATIONS IN SPRINGER SAND

	Initial test*				After workover		
	Choke, 1/64 in.	Prod., bbl. per day	Tubing pressure, psi.	Comp., bbl. per day	Choke, 1/64 in.	Prod., bbl. per day	Tubing pressure, psi.
Workover No. 1	24	191	35	None†	16	174	425
Workover No. 2	32	501	175	‡19 (zero after 6 mo.)	20	224	200
Workover No. 3	32	509	125	†11	16	162	225

*After perforation and fracturing and prior to completion in the higher zone. †After exposure to water-base mud. ‡After exposure to salt water.
All three wells are now making their allowable of 70 bbl. per day.

A previous reference has been made to specific wells which had been severely damaged by contact with water-base mud or water. Three specific case histories of such are given in Table 3 together with the results obtained recently by working over these wells, using inverted emulsion mud.

The wells were in Northeast Purdy field, Garvin County, Oklahoma. In each case the Springer zone had been severely damaged, although production had been obtained from the Hart sand. In each case, the workover consisted of placing inverted emulsion mud in the hole to kill production from the Hart, fracturing the Springer sand with oil, and recompleting with Springer production flowing through tubing and Hart production flowing through the casing-tubing annulus.

Successful workover techniques have included fracturing with oil. Fracturing with an aqueous fluid or application of acid is an obvious departure from the entire objective of using the inverted emulsion mud and is not recommended.

Logging . . . Since the inverted emulsion mud is essentially electrically nonconductive, the use of conventional resistivity and self-potential logs is not possible in this system. However, logging methods which do not require a conductive medium may be utilized. It has been noted that inasmuch as holes drilled with the inverted emulsion are very close to gage, neutron, gamma-ray, and induction logs are greatly improved because of the relatively uniform hole diameter. This may compensate, in some degree, for the inability to use logs requiring a conductive medium.

Examination of cuttings has not been handicapped by use of the inverted emulsion. Cuttings, particularly shale, are recovered in good condition, and the film of emulsion mud can be easily removed by rinsing. A commercial detergent, and ammonia in water have been used successfully for this purpose. A strong solution of soda ash has been similarly used. Company geologists who have become familiar with this mud are of the opinion that most of the interpretation problems can be solved when personnel become accustomed to gamma ray, neutron, and induction logs and have obtained additional experience in examination of cuttings.

Mud costs . . . Costs of emulsifiers to prepare the inverted emulsion mud have been in the range of $3 to $4 per barrel. It is anticipated that these figures will be reduced by 50 per cent in the near future by further modification in formulation. It should be noted, however, that these costs are based on wholesale material costs.

A very appreciable saving has been effected in the reuse of these mud systems. Although it was followed through eight or nine operations, the first system in use has been reused and combined with new mud and portions of other systems until its identity has been lost. Presumably, a portion of the original mud is still in use.

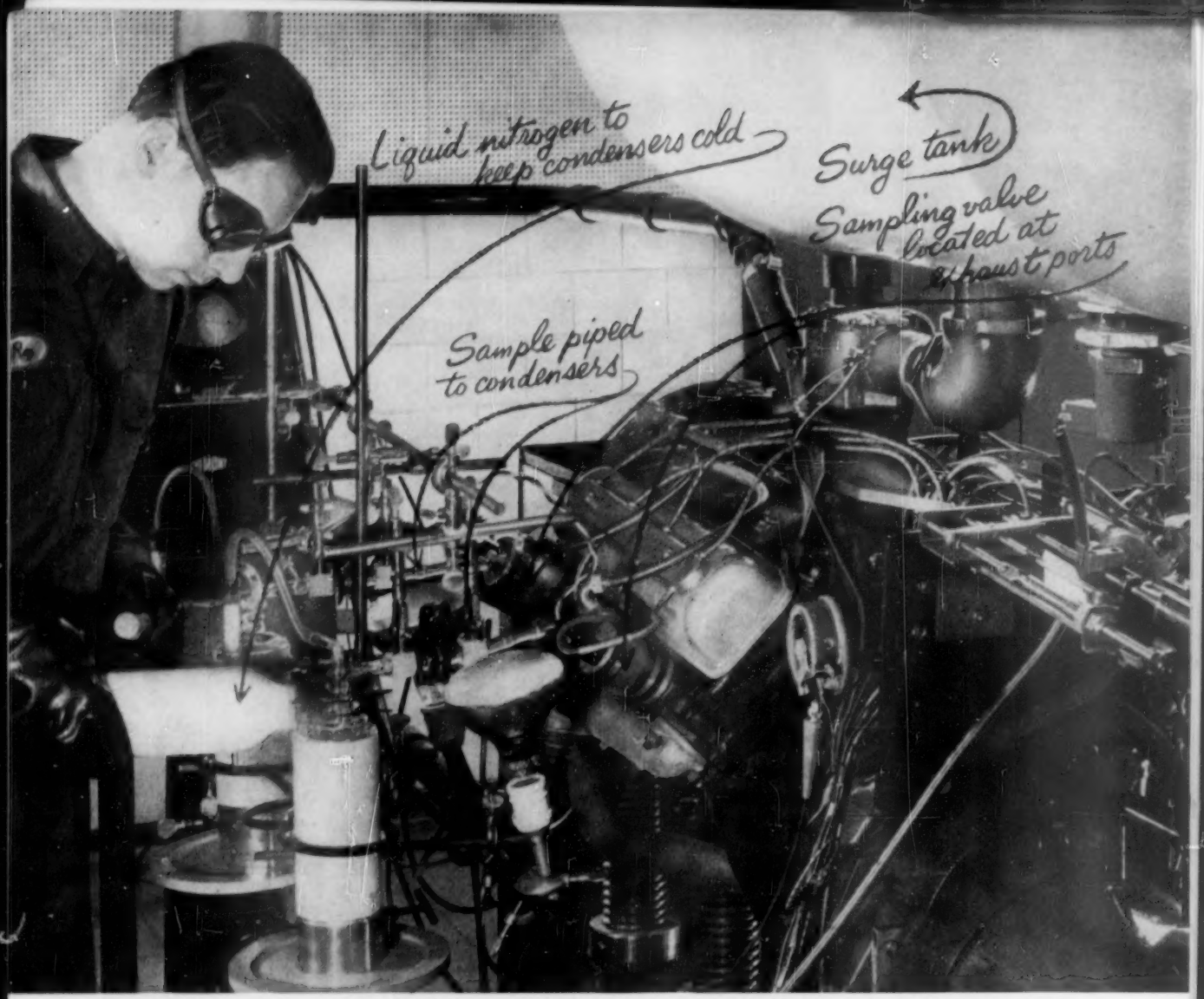
Control procedures . . . Control of the inverted emulsion system is based on three characteristics: viscosity, filter loss, and emulsion stability. Mud density is controlled to suit drilling and is essentially an independent factor.

The yield value and gel strengths of the inverted emulsion mud are very low. For this reason, a single-point viscosity measurement, taken by itself, has more meaning than in the usual water-base mud (Fig. 2). Funnel viscosities, usually kept between 100 and 200 seconds, are useful in field control. Viscosity is most readily raised by adding water-base mud. Viscosity is lowered by adding oil. Certain emulsifiers also affect viscosity.

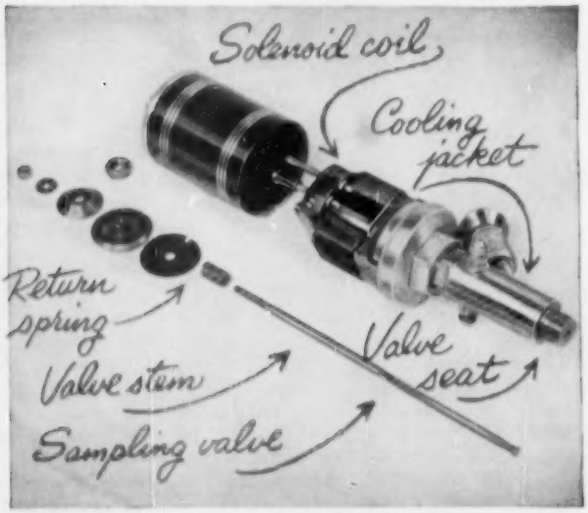
The A.P.I. 30-minute filter loss should be kept at less than 1 cc., preferably zero, with all filtrate being oil. Filter loss is reduced by adding emulsifiers, although various other materials have been used for this.

An emulsion stability of 100 (volts) has been arbitrarily set as a desirable minimum for field operations. However, muds with much lower stability have given good performance. The obvious desirability of high values of stability shows in Fig. 2.

If the inverted mud system is made according to the conditions and requirements of the hole, test and maintenance procedure can easily be made routine. Then, it requires little attention.


Liquid nitrogen to keep condensers cold
Surge tank
Sampling valve located at exhaust ports
Sample piped to condensers

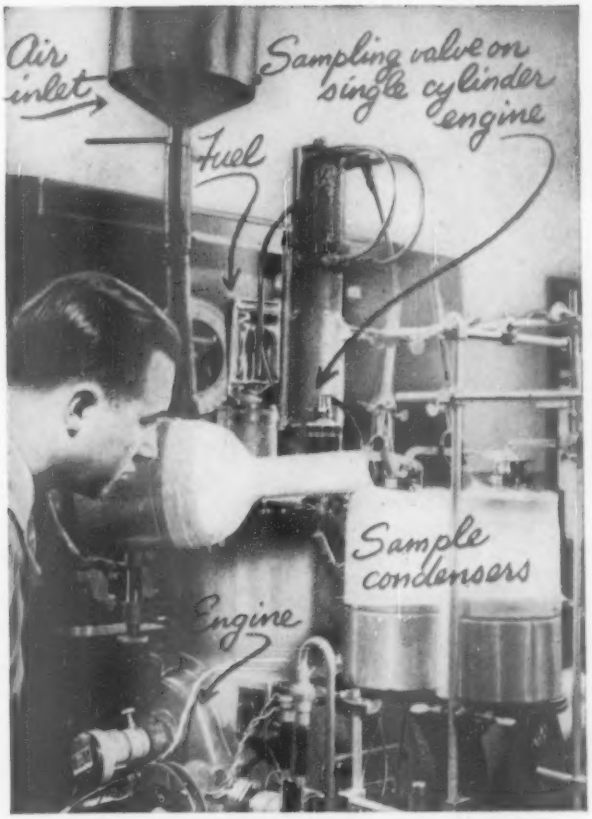
Special instrumentation enables Ethyl Research people to trace fuel distribution to each cylinder, and sample gases at a given moment during combustion. Samples are removed from the cylinders by carefully timed sampling valves.



Exploded view shows tiny electrically driven poppet valve, which is mounted in the cylinder head.

Less than 1/1,000 of a second is required for the sampling valve to open and close.

Heavy hydrogen put to work by Ethyl Research



High-speed sampling technique was developed on single-cylinder engines like the one shown above.

Mass spectrometer, developed by Consolidated Engineering Corp., analyzes the condensate, picking out the "tagged" atoms. This shows how the hydrocarbon mixture was distributed among the various cylinders.

One of the reasons why an engine knocks is this: all cylinders do not receive the same air-fuel mixture—and so distribution of hydrocarbons varies from cylinder to cylinder! Though this may cause knock to occur in only one cylinder, it can boost the antiknock requirement of the entire engine!

How much do the hydrocarbons in the mixture vary from cylinder to cylinder? And what can be done about it?

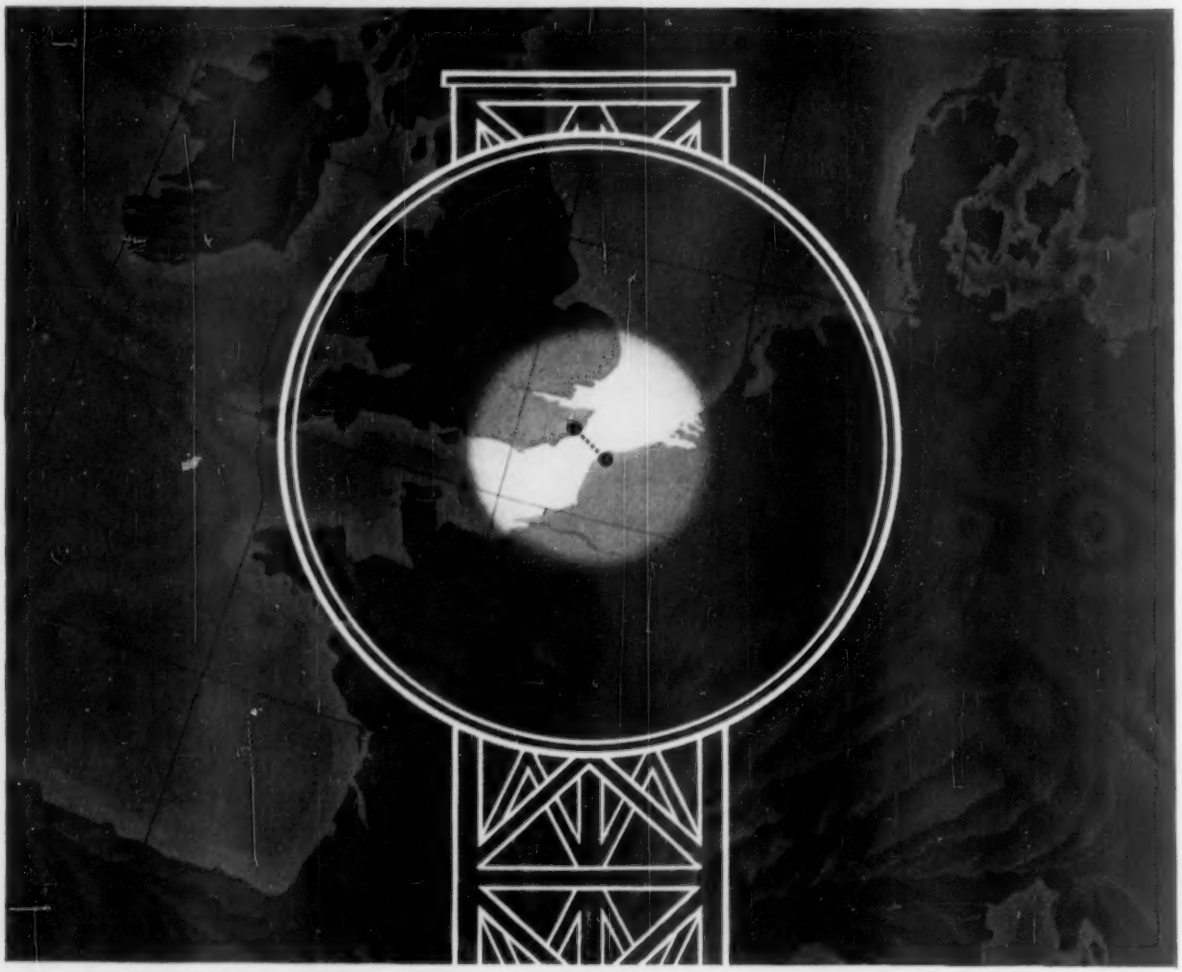
To track down the answers to these questions, Ethyl Research people assembled a special test apparatus. High-speed sampling valves were inserted in the combustion chambers of a conventional passenger-car engine so samples of the burned gases could be collected from all cylinders.

The test procedure works like this: Various components of the gasoline are "tagged," one by one, by replacing an ordinary hydrogen atom with an atom of heavy hydrogen. The special fuel is then burned in the engine. Samples of the burned gases from the cylinders are collected, condensed and then analyzed in a mass spectrometer. This machine records the presence of the "tagged" components and so gives Ethyl a picture of fuel distribution to the cylinders.

This is part of a program to help refiners manufacture gasolines that will distribute more uniformly from cylinder to cylinder and thus help them control one cause of knock on the road.

ETHYL CORPORATION
Research Laboratories
1600 West Eight Mile Road, Ferndale 20, Michigan
2600 Cajon Road, San Bernardino, California

FEDERAL MICROWAVE—"CERTIFIED BY A WORLD OF RESEARCH"



"Hello, Calais, this is Dover calling!"

Nearly a quarter of a century ago the world's *first* public demonstration of microwave communication took place across the English Channel, when scientists of International Telephone and Telegraph Corporation established telephone and teleprinter service between Calais, France, and Dover, England.

Out of this historic experiment IT&T developed the world's *first commercial microwave link* . . . the techniques and processes that resulted in one major "first" after another . . . in multichannel relay systems, television links, multiplex broadcasting, and diplexing.

Today, through *Federal* Microwave, private companies and administrations can draw upon IT&T's unique record in microwave pioneering . . . its still expanding pool of world-wide experience in research, engineering, manufacturing and system operation.

Federal can supply all microwave needs from under one roof . . . links and networks of any channel capacity . . . also associated telephone, carrier, and VHF mobile radio equipment . . . every facility for a complete, smooth-working system . . . *"Certified by a World of Research!"*

Federal

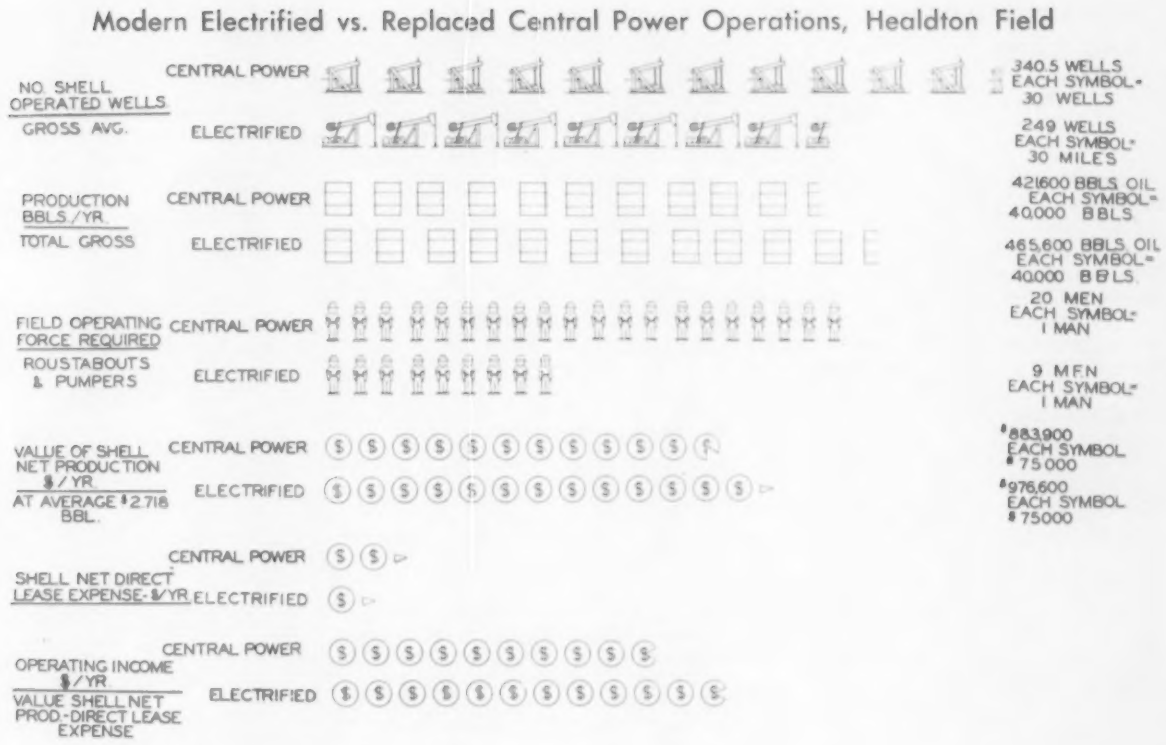
A DIVISION OF IT&T

Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

100 KINGSLAND ROAD • CLIFTON, NEW JERSEY

In Canada: Standard Telephones and Cables Mfg. Co. (Canada) Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., New York


Modern Electrified vs. Replaced Central Power Operations, Healdton Field
NO. SHELL OPERATED WELLS GROSS AVG.
CENTRAL POWER
ELECTRIFIED
340.5 WELLS EACH SYMBOL= 30 WELLS
249 WELLS EACH SYMBOL= 30 MILES
PRODUCTION BBLS./YR. TOTAL GROSS
CENTRAL POWER
ELECTRIFIED
421,600 BBLS. OIL EACH SYMBOL= 40,000 BBLS.
465,600 BBLS. OIL EACH SYMBOL= 40,000 BBLS.
FIELD OPERATING FORCE REQUIRED ROUSTABOUTS & PUMPERS
CENTRAL POWER
ELECTRIFIED
20 MEN EACH SYMBOL= 1 MAN
9 MEN EACH SYMBOL= 1 MAN
VALUE OF SHELL NET PRODUCTION $/YR. AT AVERAGE $2.718 BBL.
CENTRAL POWER
ELECTRIFIED
$883,900 EACH SYMBOL $75,000
$976,600 EACH SYMBOL $75,000
SHELL NET DIRECT LEASE EXPENSE-$/YR
CENTRAL POWER
ELECTRIFIED
OPERATING INCOME $/YR. VALUE SHELL NET PROD.-DIRECT LEASE EXPENSE
CENTRAL POWER
ELECTRIFIED

Here are results of

Modernization of Obsolete Pumping Equipment

. . . in Southern Oklahoma

by Frank Poorman

A MAJOR problem facing many operators is the profitability of replacing obsolete wornout production equipment on low-income stripper wells. This paper reviews and evaluates the economics of a major equipment modernization program recently completed by Shell Oil Co. covering 464 stripper wells in southern Oklahoma. This project involved replacement of 20 to 40-year-old rod-line central powers or rig fronts with electric-motor-driven unit pumpers.

Statistical results from a study of Healdton field show that modernization of 249 wells increased production 10.4 per cent although the number of operating wells was decreased 27 per cent. And it became possible to reduce operating costs 45.6 per cent through the use of efficient modern equipment. On the basis of the Healdton field study, an undeferred net profit of $3,177,000 or 353 per cent on the investment of $900,000 for modernization of 464 wells is indicated from possible operating-cost savings alone.

Author is with Shell Oil Co., Centralia, Ill. Paper presented at spring meeting of Mid-Continent A.P.I. district, Division of Production, Amarillo, 1955.

Conditions Leading to Equipment Replacement

A great portion of the major production equipment on Shell's older southern Oklahoma properties had been installed when the wells were originally completed and was from 20 to 40 years old. In most instances, operations had become excessively expensive because of the age of this equipment and, in some cases, equipment had failed completely. Continued operation of these leases had, therefore, become a major problem. Additional impetus was given to the need for replacement of this equipment because:

1. The old wells had substantial reserves and an average remaining life in excess of 20 years.

2. Deeper horizons under many of the older properties and under adjacent new leases were being exploited.

There were, therefore, two alternative approaches to the problem:

1. To continue operation of the old stripper production by repairing the original equipment and replacing component parts as failure occurred; or

2. To undertake an equipment-replacement program on a scale never before attempted by Shell on old stripper production.

In either case the new production would be electrified to provide efficient pumping installations requiring minimum operating expense.

A thorough investigation of the problem resulted in the adoption of the latter alternative for the following reasons:

1. Electrification and accompanying automatic controls would reduce operating expense and reduction of manual

ELECTRIFIED INDIVIDUAL UNITS VS. OBSOLETE CENTRAL POWER OPERATIONS—HEALDTON FIELD

	Central power (costs based on 1951 operations)	Electrified (based on period June 1953 through March 1954)	Change due to modernization — Amount — Increase	Amount — Decrease	Per cent — Increase	Per cent — Decrease
Number Shell operating wells, gross average	340.5	249		91.5		26.9
Production, bbl. per year:						
Total gross	421,600	465,600	44,000		10.4	
Shell net	325,200	359,290	34,000		10.5	
Gross barrels of oil per man-hour	11.2	24.9	13.7		122.3	
Average gross oil production per well, barrels per month	103.2	155.8	52.6		51.0	
Average man-hours per well month	10.2	6.2		4		39.2
Value of Shell net production, dollars per year (at average of $2.718 per bbl.)	$883,894	$976,550	$92,656		10.5	
Net direct lease expense:						
Dollars per year						45.6
Dollars per gross well, monthly						25.6
Dollars per net barrel						50.8
Operating income, dollars per year (value Shell net)					22.4	

Production (direct lease expense):	
Total cost of modernization	$459,229
Payout on Shell's share from net operating savings only, years	—5.92
Payout on Shell's share from Shell net increased operating income, years	—2.56

ESTIMATED PROFIT FROM REDUCED OPERATING COST ONLY

(Modernized wells vs. continued operations with old central power equipment, replacing component parts as failure occurred)

End first 10 years after modernization, including payout period	$287,700
End of 20 years	922,000
End of 30 years	1,480,000

operations would make it possible for operating personnel to do more important work and assume greater responsibility.

2. Production would increase because of more efficient operation.

3. The cost of modernization would be repaid by savings in operating costs alone.

Healdton Field Program

Procedure . . . Although much of the advanced planning was started as early as 1946, the first concentrated replacement of this deteriorated equipment was undertaken in Healdton field during December 1951. By May 1953, some 249 wells had been equipped with individual beam-pumping units driven by electric motors. This field is particularly amenable to analysis because:

1. Adequate cost records, prior to modernization, are available.

2. There has been no new development which would render a comparison with former operations invalid.

3. Modernization has been completed for a sufficient period to establish definite results.

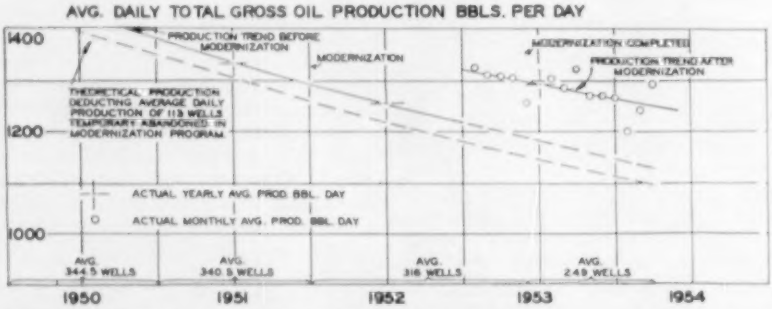
This is the largest single project in the over-all program and represents approximately 51 per cent of the total expenditure for modernization.

For modernization purposes, the leases of Healdton field were grouped into contiguous operating blocks of leases. The condition of equipment on each block was analyzed and considered along with allied reserves, operating costs, and remaining life, and a careful evaluation was made of possible operating savings to be obtained with modern equipment.

An estimate of the cost for each project indicated an individual well expense of approximately $1,835. The minimum production rate necessary to return this cost was found to be 1 bbl. of oil per well per day. The wells to be included in each project were determined on the basis of an accurate 3-day production test. As a result, 113 wells producing a total of 34 bbl. of oil per day (0.36 bbl. of oil per well per day) were temporarily abandoned.

It was usually necessary to replace the bottom-hole pumps in these wells, because the existing cup-type pumps were too large for the well fluid capacity and would have overloaded the small unit pumpers and electric motors. These pumps were replaced with metal-to-metal sectional liner pumps in order to reduce well-servicing costs.

Scheduling . . . The construction was so scheduled that excessive loss of pro-



MODERNIZATION OF PUMPING EQUIPMENT resulted in 10.4 per cent increase in oil obtained in this field in southern Oklahoma. Fig. 1.

VISCO
REG. U.S. PAT. OFF.
OIL TREATING
507
COMPOUND
55 U. S. GALLONS
VISCO PRODUCTS CO. Inc.
HOUSTON, TEXAS

Call your

BUTLER

Distributor for . . .

SAFE EASY

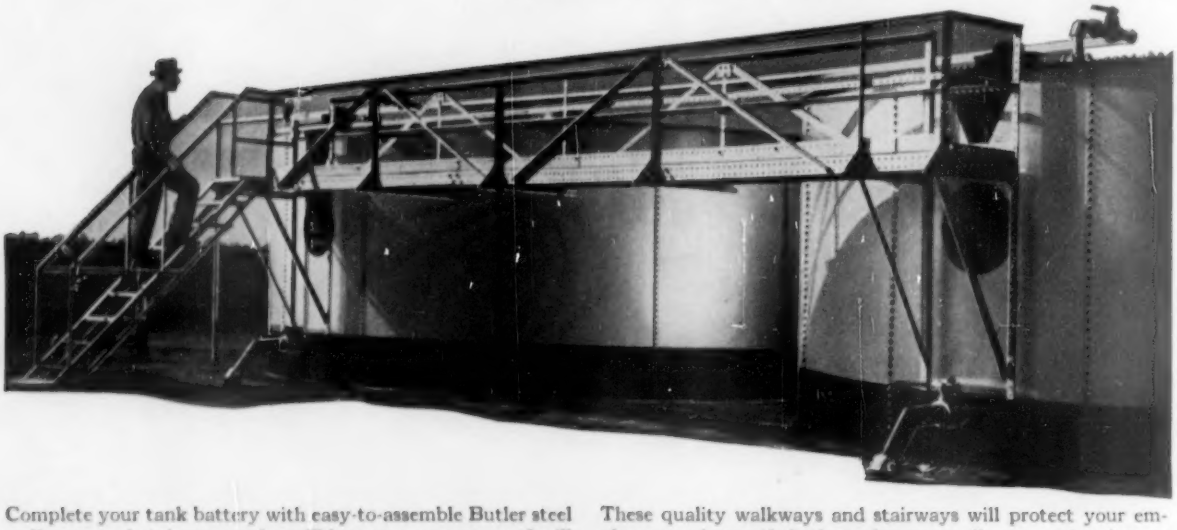
access to your bolted tanks with steel walkways and stairways

UNION TANK AND SUPPLY COMPANY

Abilene, Texas	Nocona, Texas	Russell, Kan.	Fort Morgan, Colo.
Alice, Texas	Odessa, Texas	Wichita, Kan.	Sterling, Colo.
Dallas, Texas	Dubach, La.	Ardmore, Okla.	Casper, Wyo.
Fort Worth, Texas	LaFayette, La.	Oklahoma C., Okla.	Newcastle, Wyo.
Houston, Texas	New Orleans, La.	Tulsa, Okla.	Powell, Wyo.
Midland, Texas	Great Bend, Kan.	Hobbs, N. M.	Williston, N. D.
	Plainville, Kan.	Denver, Colo.	

AMERICAN PIPE AND SUPPLY COMPANY
Casper, Wyoming Denver, Colo. Cut Bank, Montana

HARRY G. MILLER
El Dorado, Arkansas



Complete your tank battery with easy-to-assemble Butler steel walkways and stairways and you'll be sure your personnel will work in safety, with greatest efficiency.

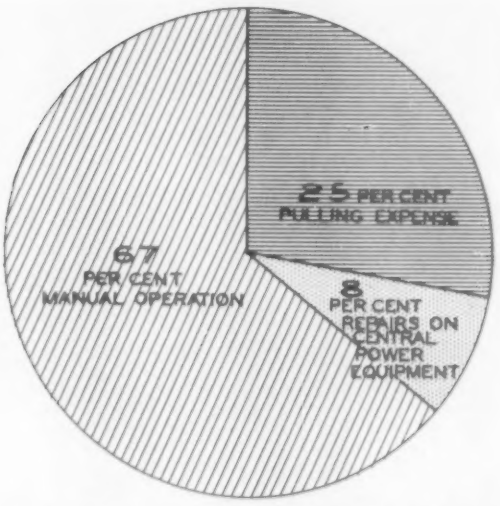
These firmly cross-braced walkways and stairways give years of service, require little maintenance, fit any A.P.I. bolted tank. Stair treads are wide, roomy, and burr-punched for safety. Hand rails have rounded corners, are convenient, easy to reach.

These quality walkways and stairways will protect your employees and save their time wherever walkways and stairways are used, such as for trackside loading racks.

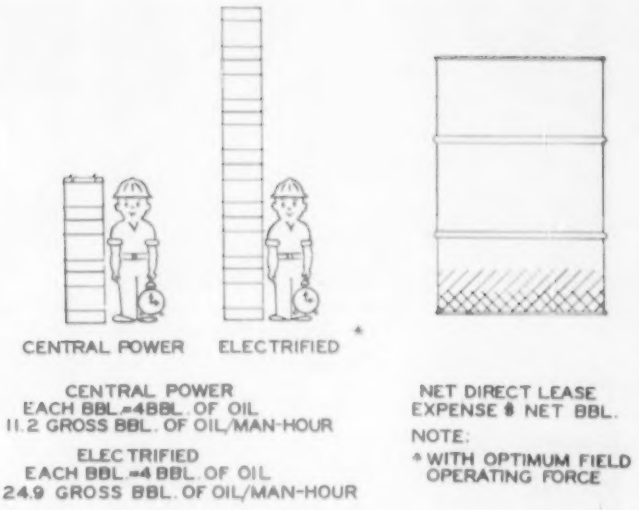
The next time you bring in a well, call your nearby Butler distributor. He has the right size and type of walkways, stairways, and Butler bolted tanks on hand to fit your needs exactly, and the organization to erect them quickly.

BUTLER MANUFACTURING COMPANY
7464 East 13th St., Kansas City 26, Missouri

Manufacturers of Oil Equipment • Steel Buildings • Farm Equipment • Dry Cleaners Equipment • Special Products
Factories located at Kansas City, Mo. • Galesburg, Ill. • Richmond, Calif. • Birmingham, Ala. • Houston, Texas • Minneapolis, Minn.



DIRECT LEASE EXPENSE can be cut 45.6 per cent by modernization of pumping equipment. Source of these savings is shown here. Fig. 2.



MODERNIZATION OF HEALDTON FIELD resulted in more than twice as much gross barrels of oil produced per man-hour required. Fig. 3.

duction from down time was prevented. After each well was equipped, the equipment was carefully checked for pumping load and proper sizing of motor protective devices. Individual pumping schedules were determined by use of a recording pumpoff indicator and the load on the power source was balanced, insofar as possible, by the proper scheduling of part-time producing wells. Back pressure on the formation caused by fluid in the well bore is being kept to a minimum, thereby assuring the maximum rate of production from each well. In general, wells are operated at the slowest practical speed to reduce horsepower and energy requirements.

Also, as equipment modernization progressed, a reduction in manual operating requirements was achieved. This made it possible for operating labor force to be reduced on the leases thus affected. It was not necessary, therefore, to fill certain vacancies occasioned by normal retirements on pensions, and transfer of some of the men, made available through modernization of these properties, enabled us to operate new fields without increasing our labor force in southern Oklahoma. Replacement of obsolete equipment, electrification, and accompanying automation also afforded a reduction in the more strenuous duties required. Elimination of the necessity for starting large engines and operating other heavy equipment made the work easier for our older operating employes.

Results

Oil production . . . By extending the production curve prior to modernization and comparing it with actual production subsequent to modernization, Fig. 1, it will be noted that an additional 44,000 bbl. of oil per year, or 10.4 per cent increase, is being obtained. This increase in production was achieved even though approximately 27 per cent of the wells were temporarily abandoned because they could not support modernization expense.

Direct lease expense . . . Making optimum use of the field operating force, net direct lease expense would be decreased approximately 45.6 per cent as a result of modernization. The source of these savings is presented in Fig. 2. The saving in operating expense alone would return the cost of modernization in approximately 6 years. If the value of increased production is added to these savings in operating costs, the investment would be returned in approximately 2½ years at an annual rate of about $163,000. When compared with continued operations by repairing the old equipment and replacing component parts as needed over a 30-year period, modernization would result in an undeferred net profit of $1,480,000, or 354 per cent, on Shell's share of the total investment of some $459,000 for the Healdton field modernization. Fig. 3 illustrates that net direct lease expense per net barrel would be reduced 50 per cent and that the gross barrels of oil produced per man-hour required would be more than doubled subsequent to modernization.

Over-all program . . . In all, 464 stripper wells were equipped with individual unit pumpers, electric motors, and automatic well controls at a total cost of approximately $900,000. A total undeferred net profit of approximately $3,177,000, or 353 per cent, appears possible solely from reduced operating costs.

As a result of the over-all program, 156 wells were temporarily abandoned or plugged because they could not support the cost of new equipment.

By an expenditure of some $417,000 for the replacement of deteriorated production equipment on 249 wells in Healdton field, the following results are indicated:

1. Gross oil production increased some 44,000 bbl. per year, or 10.4 per cent, while the number of operating wells decreased approximately 27 per cent.

2. Making optimum use of the field labor force, a $70,500 per year reduction in direct lease operating expense would be obtained, 67 per cent attributable to reduced equipment repair and well-maintenance costs.

3. This operating saving would result in an undeferred net profit of $1,480,000, or 354 per cent on the investment, and would return the expenditure through savings alone in approximately 6 years.

4. The $163,000 per year increase in income from increased oil production and decreased operating expense would repay the investment in approximately 2½ years.

Over-all program:

1. An undeferred net profit of approximately $3,177,000 or 353 per cent, on a total expenditure of approximately $900,000 for the modernization of 464 stripper wells in southern Oklahoma appears reasonable, solely from savings in operating cost.

2. Although substantial increases in production should accrue from the over-all program, a direct analysis is not presently practical because of the effect of the development of new producing horizons on the leases.

A 75-PER CENT SAVINGS IN WEIGHT IS ACHIEVED when bubble caps and trays are made of Republic ENDURO Stainless Steel. Those pictured above are fabricated from 410 stainless steel, are extremely strong though lightweight, and resistant to corrosion present in oil refining. For better economy and long-range performance, specify equipment made from stainless steel.

FOR MONEY-SAVING DEPENDABILITY, Republic Alloy Steels are widely used in drilling operations. Parts made from alloy steels are safer, stronger, last longer. Where maximum strength is essential to safety, as in the Kelly joint and drawworks above, operators know they can depend on equipment made from Republic Alloy Steels.

THERE ARE NO COSTLY DELAYS when you line up Republic Steel Line Pipe. Always-constant circumference and uniform wall thickness help joints match up accurately and quickly for fast welding. Republic makes three kinds: Electric Resistance Weld (2⅜" through 16" O.D.), Electric Fusion Weld (24" through 30" O.D.), and Continuous Butt Weld (⅛" through 4" nominal).

Cut Pipeline Costs As Easily As You Cut This Pipe!

IT'S REPUBLIC

...Now Available in Both

You'll be amazed how many ways Republic Semi-Rigid Plastic Pipe can cut overhead in your oil piping systems.

For example—

Installation is extremely fast and easy, therefore less expensive. Note the few simple steps shown at right. Semi-Rigid cuts and joins rapidly with no need for expensive welding equipment. And because it's so lightweight, a long string can be assembled quickly. In fact, three men can lay over 4000 feet of 4" Semi-Rigid in one day.

Republic Semi-Rigid resists most corrosion found in oil fields. Acid or alkaline soils will not attack it. Neither will salt water. Moreover, it is not subject to electrolytic action. This all adds up to fewer production interruptions, *a big saving in replacement costs.*

If you're pumping high-paraffin crude, you'll have no worries from excessive cleaning bills with Semi-

REPUBLIC STEEL CORPORATION
3112 East 45th Street,
Cleveland 27, Ohio

REPUBLIC STEEL

Please send me more information on:

- ☐ Republic Plastic Pipe
- ☐ Republic Alloy Steels
- ☐ Republic ENDURO® Stainless Steels

Republic Line Pipe—

- ☐ Electric Resistance Weld
- ☐ Electric Fusion Weld
- ☐ Continuous Butt Weld

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

OPL

REPUBLIC

World's Widest Range of Standard

CUT Republic Semi-Rigid Plastic Pipe can be cut easily to the proper length with ordinary handsaw or hacksaw. When relocation of pipe is desired, it can be cut and new sleeve joints made with no loss of pipe length.

CLEAN To assure proper bond, ends of both lengths to be joined and plastic fitting should be wiped clean of dirt or other foreign matter. Entire joining procedure requires only a few seconds.

SEMI-RIGID

Butyrate and Kralastic

Rigid Butyrate. Since paraffin cannot get a foothold on the smooth inner walls, the danger of large deposits building up is practically eliminated. Smooth inside surfaces also permit a high rate of flow, reduce friction losses.

Republic Semi-Rigid Plastic Pipe offers other advantages, too—such as flexibility to follow terrain contours, good impact resistance (it's tough and durable!), and less maintenance.

For a trouble-free system it will pay you to investigate both Semi-Rigid Butyrate and Kralastic. Butyrate is available in 20-foot lengths—9 sizes from ½″ through 6″—and in coils of ½″, ¼″ and 1″ diameters. Kralastic, newest addition to Republic's line, comes in a wide range of working pressures —½″ through 6″ diameters. Republic also makes Flexible Polyethylene Pipe for water lines to drilling rigs and other cold water applications. Send coupon for illustrated literature on all three today.

STEEL

Steels and Steel Products

APPLY SOLVENT Using standard paint brush, coat the inside of the fittings and the outside of the pipe with special thinner. Welding cement is next applied with same brush. Saw and brush are only tools needed.

JOIN The two lengths are joined by stabbing the pipe in the fitting and giving one-eighth turn. Bond is permanent and as durable as the pipe itself. For joining plastic pipe to metal, special fittings are available.

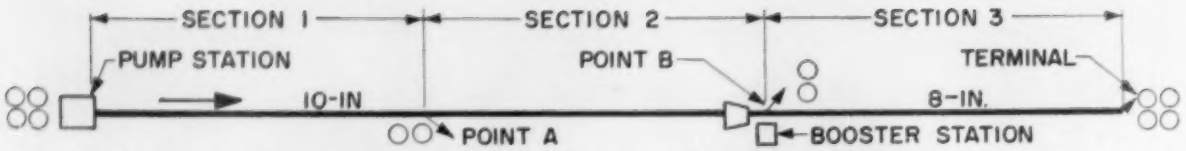


Fig. 1—Schematic of a pipeline system, consisting of 10 and 8-in. pipe, with two intermediate takeoffs and an end terminal.

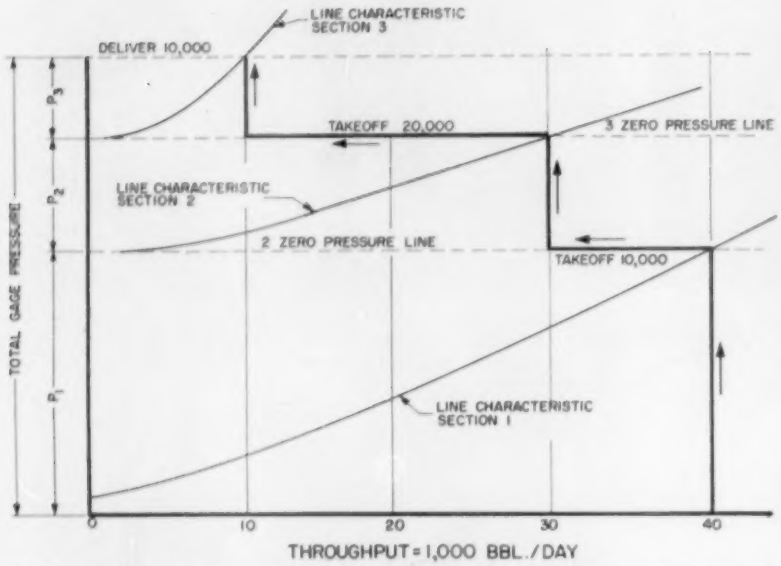


Fig. 2—Graphical solution for gage pressures corresponding to specific rates of flow in each section for Case No. 1.

Here's a graphic method of

Determining Operating Pressures

... at various points in a closed products system

by Frank E. Hangs

NORMAL operation in a closed products pipeline system may necessitate taking off consignments simultaneously at several points in the system and at different rates of flow. At other times the delivery may all be made at one or two points. Naturally, such a variety of operating conditions cause changes in the pressure levels at many points in the system. For most efficient pipeline operation it is advantageous to be able to predict the required pressure levels at takeoff points in the system. While hydraulic computations can be made to determine these pressures, they are time consuming and hardly adapted for use in a dispatching office, or for general operating purposes.

The following graphic solution is offered for quickly determining pressures at various points in a system, with simultaneous deliveries at different rates of flow. In order to illustrate the principles involved, let us assume a products system, Fig. 1, consisting of 10 and 8-in. pipe, with two intermediate takeoffs and an end terminal. Two different operating conditions will be considered: (1) One pump station and two intermediate takeoffs; (2) the same system with a booster station. The system is divided into sections between delivery points and the pressure-capacity characteristics for gasoline for each section are calculated and plotted to the same scales. The first section should be on a large sheet of coordinate paper and the others on tracing paper or acetate film. For a specific example, let us assume 40,000 bbl. per day leaves the station: 10,000 bbl. is delivered to point A, 20,000 bbl. to point B and the remaining 10,000 bbl. to the end terminal.

Fig. 2 indicates how the three characteristic curves can be superimposed to determine the pressures at the takeoff points. Note that zero pressure line of Section 2 passes through the point where 40,000 bbl. per day crosses the characteristic for Section 1, and the zero pressure line for Section 3 passes through the point where the 30,000 bbl. per day line crosses the characteristic for Section 2. Now it can be seen that the pressure drops (friction plus static) for the various sections are P_1, P_2, and P_3 respectively. The sum of all

Author is chief design engineer, Pipe Line Technologists, Houston.

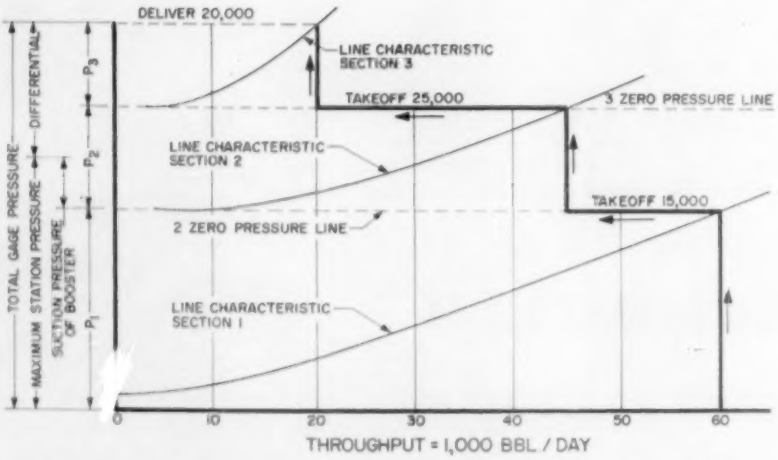
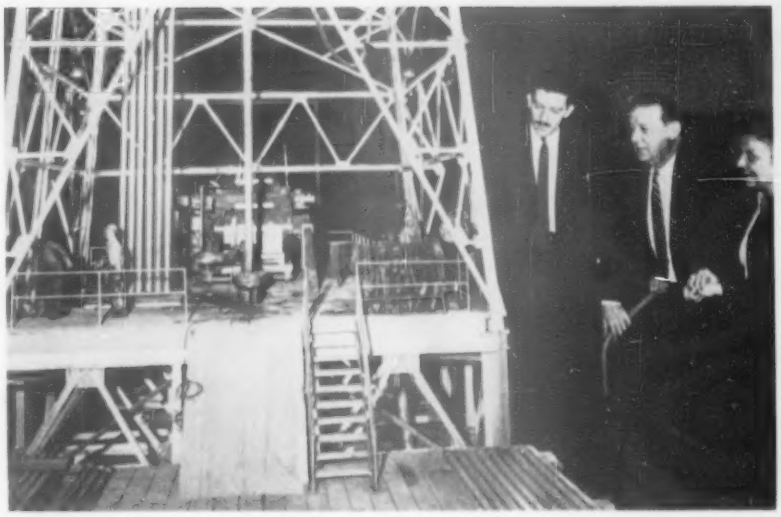


Fig. 3—Graphical solution for gage pressures corresponding to specific rates of flow in each section for Case No. 2.

three is the station discharge pressure. The pressure at point A is $P_2 + P_3$ and at point B is P_3. If there were no delivery at point A, place the sheet for Section 2 as before, then the zero pressure line for Section 3 must now cut the characteristic of Section 2 at the same rate of flow as for Section 1 since there is no takeoff. It will be convenient to prepare a separate pressure scale which could be used to measure the different pressures directly.

Fig. 3 shows the system with a booster station. Here the flows are assumed to be 60,000, 40,000, and 20,000 bbl. The curves are superimposed as before. Note that the total gage pressure exceeds the maximum for the first station; therefore, it is necessary to bring on the booster to provide the differential between the first station and the total pressure required for the system. In Fig. 3 the discharge pressure at the first station is the maximum allowable working pressure, or P_1 + suction pressure at booster. However, the discharge pressure at point A is $P_2 + P_3$ and at point B is P_3, the same as Fig. 2.

There are other possibilities for these charts. If there are more takeoffs, then more overlays can be prepared and a complicated system can be subdivided into simple components. In the examples given only one product, gasoline, was considered. Characteristic curves for other products, such as kerosine or diesel oil, can be drawn for each section along with the gasoline curve. This will greatly increase the usefulness of these charts as one section may be filled with kerosine or other product while others may have gasoline. In the event one product is displacing another in any section, then the pressure at given points can be bracketed within narrow limits, as it must always be between the curves for the two products.



Even the sounds are reproduced on

Model Drilling Rig in Museum

Model aids viewers visualize drilling problems

THIS drilling rig is a 22-ft.-high detailed model complete down to even some typical rig noises. It is a part of the Hall of Oil Geology which was opened recently at the American Museum of Natural History in New York. Shown here at the side of the model are three of those who helped prepare the exhibit: Lothar P. Witteborg, head of the museum's exhibition department; E. M. Gretzler, sales manager, National Supply Co., Inc.; and Mrs. Pearle Blackman, research draftswoman and artist with Standard Oil Co. (N.J.)

The exhibition was a cooperative effort of the museum and Jersey Standard in which the oil company furnished technical guidance and substantial financial support. Many oil service companies also played an important part in preparing the displays.

The complete exhibition extends over 150 by 40 ft. of the museum's main building. Three-dimensional models and dioramas as well as graphic charts and maps are employed to present many of the basic principles of oil formation, distribution, exploration, and production.

Norman D. Newell, curator of historical geology for the museum, said the Hall of Oil Geology is probably the largest and most complete exhibit of its kind ever constructed. It will be a part of the museum's attractions for at least 10 years. The cost was more than $75,000.

Museum officials said that after the exhibit was opened, the public showed a keen interest in the display. It was estimated that the majority of 2,000,000 visitors expected at the museum this year would view the hall. Geologists and other oil-industry people as well as geology students formed a large share of the first visitors.

The consensus of visiting oil men was that the hall is an accurate, clear picture of oil geology that can be understood without technical knowledge.

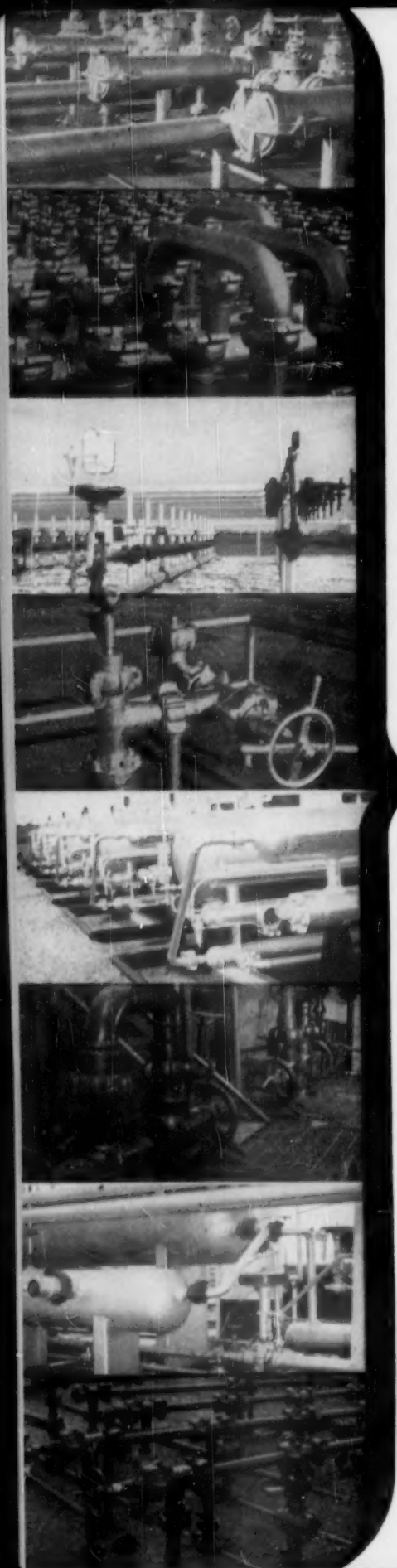
NELSON REFINERY CONSTRUCTION INDEX

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained July 7, 1952 (page 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

Index (1946 = 100)

	1948	1950	1952	1953	1954	Jan. 1955
Pumps, compressors, etc.	127.0	138.2	155.6	162.5	166.5	165.6
Electrical machinery	127.6	134.9	154.2	156.4	160.0	160.7
Internal-combustion engines	116.9	126.0	146.5	148.1	150.5	149.9
Instruments	120.0	127.8	146.2	151.8	154.6	158.1
Heat exchangers	130.0	140.0	165.8	174.9	171.7	152.1
Miscellaneous equipment average	*122.1	*126.2	153.3	158.8	160.7	157.3
Materials component	139.3	149.5	164.3	172.4	174.6	173.3
Labor component	128.0	144.0	163.1	174.2	183.3	186.4
Nelson construction index	132.5	146.2	163.6	173.5	179.8	181.2

*Used in computing the Nelson Index until April 1952. These are slightly different from the average of the Miscellaneous Equipment Items shown above.

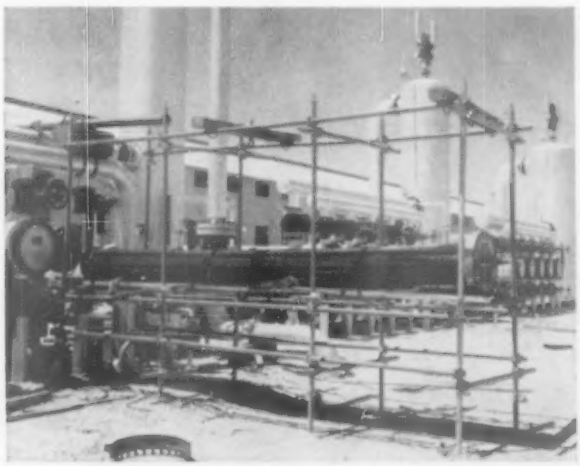


THERE IS ONLY ONE

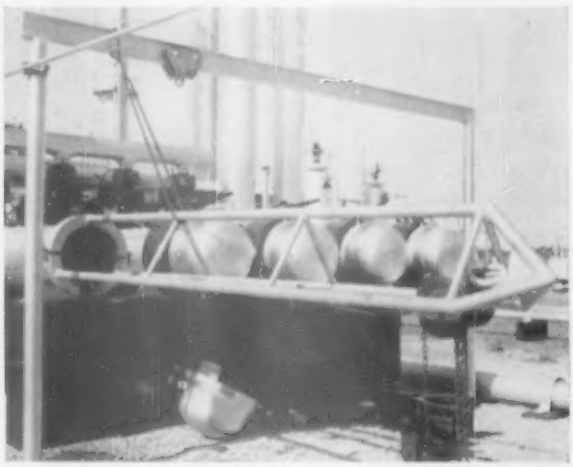
UNIBOLT

Distinctive features: **Lighter but stronger**—its unique design results in minimum bulk and weight yet places more metal in shear to provide greater strength. **One bolt**—simplifies assembly and disassembly and serves only to draw tapered interlocking shelves together, carrying none of the load of the coupling itself. **Adaptability**—its design readily permits adapting it to numerous fittings, as well as pipe couplings. **Interchangeability**—any part for a given size and type coupling or fitting is interchangeable, permitting minimum warehouse stocks of UNIBOLT products and replacement parts. **Broad field of application**—ALL UNIBOLT products utilize the same basic mechanical design, only the seal rings, or gaskets, differ with the class of service.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS



KNOCKDOWN SCAFFOLDING like the above is used to handle equipment like this tube bundle.



THIS FRAME is used as a backup for a chain hoist which positions tube bundles for placing in the shell.

From Magnolia's Seeligson Plant—2

Maintenance and Instrument Short Cuts

by F. Lawrence Resen
Gulf Coast District Editor

MORE on-the-job ideas at the Seeligson cycling plant, Jim Wells County, Texas, are given here. These have resulted in improved operating conditions and lower costs. Some maintenance ideas were given in the On-the-Job Section in the February 21, 1955, issue.*

Heat Exchanger Maintenance

Heat exchanger maintenance has been speeded up by using two relatively simple devices:

1. Knockdown scaffolding . . . In removing tube bundles, knockdown scaffolding has been found quite helpful. It provides a platform for receiving the bundle and repairing it on the spot. The scaffolding consists of lengths of rod held together by clamps. In this way, almost any reasonably sized scaffold may be assembled quickly. With a scaffold in place at a condenser, planks are laid along crossbars at the right height to receive the tube bundle as it is pulled from the shell.

2. Special frame . . . In replacing the bundle, a specially constructed frame is secured on the opposite end of the shell. Then a chain hoist pulls the tube bundle back through the shell into its proper position.

The frame consists of three long, horizontal lengths of 2-in. pipe. These are welded to a circular clamp at one end and terminate in a hollow pyramid at the other. The pyramid is formed by three short lengths of 2-in. pipe welded together at its apex and then welded to the ends of the three long pieces. The frame is braced by welding lengths of 1-in. pipe to it at intervals. An eyebolt extends in toward the main frame from the apex of the pyramid. Short pieces of plate steel are welded to the 2-in. pipe to provide reinforcement webbing.

In use, the end clamp is slipped over the flange on the end of the shell and bolted securely into position. The frame is then supported in a horizontal position from an overhead rail, and a chain hoist is hooked into the eyebolt. A chain from the hoist is secured to one end of the tube bundle sitting on the scaffold. Then the hoist is used to pull the tube bundle slowly through the shell into its normal position. Finally the frame is removed, the two heads of the condenser are secured, and the unit is ready to be placed into service.

Engineers of the Magnolia Petroleum Co., operator of the plant, have made a number of interesting changes involving control instrumentation. These include:

1. Control of the sales-gas dew point to lengthen dehydrator on-stream time. This is accomplished through bypassing of wet gas around the dehydrator. Amount of bypass is regulated in accordance with dehydrator unit condition.

2. Improved control of plant refrigeration system.

3. Reduction of starting load on waste-disposal pump motor to cut down on peak electrical loadings.

Other plant features include a modified backwash procedure on condensate filters, a heating system for ethane meter runs, and an oil reclamation system.

Dehydrator bypass . . . In the sales-gas system, a dew-point recorder controller and a bypass on the dehydrator units are serving to prolong the service life of the dehydrating medium (Fig. 1).

The dehydrators are set up to operate on an automatic cycle, with one on stream, one ready to go on stream, and one being regenerated. Residue gas from the absorbers goes to the dehydrator.

When a tower has been initially placed on stream, following regeneration, the dew point of the gas will be quite low, frequently down to —100° F. The sales specifications call for a

*For additional information, see The Oil and Gas Journal, May 1950, "Seeligson Field Pressure-Maintenance and Hydrocarbon-Recovery Plant."

ON THE NOSE

PRECISE ALLOY MIX GIVES *extra life* TO CHASE® ANTIMONIAL ADMIRALTY HEAT EXCHANGER TUBES

Strange that such a simple little thing as weighing could add years of life to a heat exchanger tube. Yet this careful weighing, plus extra care in manufacture, is why Chase Antimonial Admiralty Heat Exchanger Tubes *do* last longer!

Thanks to this weighing process, Chase Antimonial Admiralty Heat Exchanger Tubes contain *exactly* the right combination of metals to resist the ravages of dezincification. As a result, Chase Antimonial Admiralty Heat Exchanger Tubes mean lower operating costs, fewer breakdowns, more time between tube replacements!

Next time you plan a new installation, or replace heat exchanger tubes, install Chase Antimonial Admiralty. Enjoy extra years of service!

CHASE WAREHOUSE STOCKS: Houston,* Los Angeles, New Orleans, Tulsa**

*Handled by Standard Brass & Mfg. Co. **Handled by Vinson Supply Co.

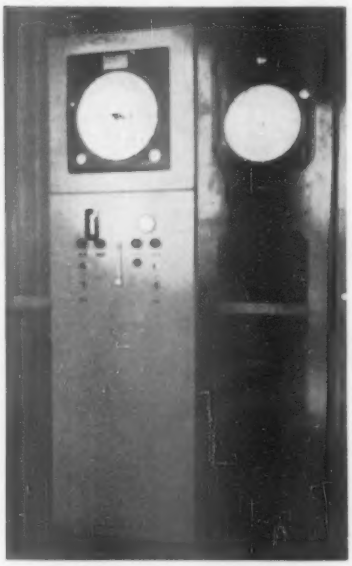
Chase®

BRASS & COPPER CO.

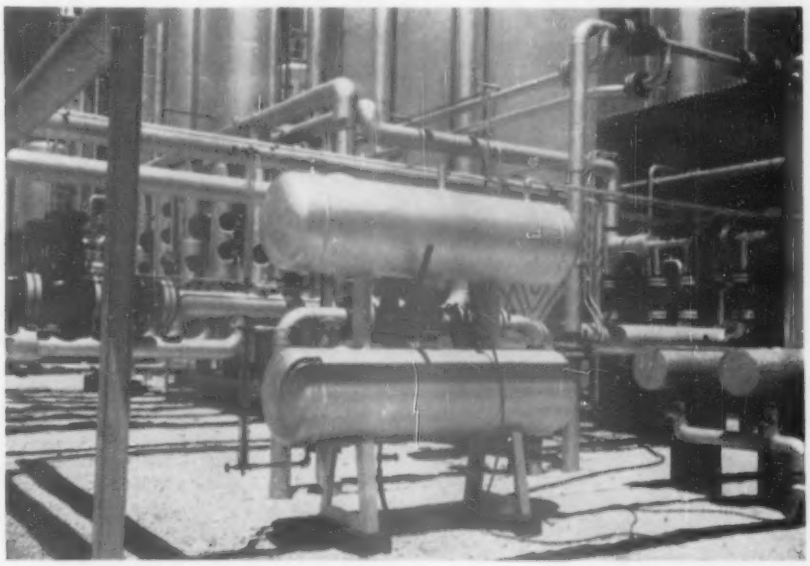
WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Detroit	Los Angeles	New York	St. Louis
Atlanta	Cincinnati	Grand Rapids†	Milwaukee	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Minneapolis	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(†sales office only)



TO MAINTAIN dew point, this dew-point temperature controller was used.



CALIBRATED TANKS like the above are used to receive condensate for checking the performance of the dehydration unit when regenerating dehydration towers.

dew point of +32° F. But as a matter of practice, deliveries from the plant are never made above +20° F. When the dehydrator begins to deliver gas at this dew point, a switch is made to another unit and the regeneration cycle is begun on the exhausted dehydrator.

With a considerable spread existing between the dew point of the gas down stream of the dehydrator and the specified dew point, much of the dehydration capacity was normally of little benefit. However, a bypass was installed to allow wet gas to commingle with dehydrated gas downstream of the dehydrator. Flow of the bypassed wet gas is controlled by the dew-point recorder controller (d.p.r.c.) located farther downstream on the sales-gas line.

The d.p.r.c., a conventional Bureau of Mines unit, continuously samples the gas stream and at the same time controls the operation of a motor valve on the bypass line. Thus, as the dew point of the dehydrated gas leaving the dehydrator increases, the d.p.r.c. will cut back on the volume of wet gas being bypassed into the dry gas line. The d.p.r.c. maintains the outgoing gas at a +20° F. as previously noted.

With this arrangement, the volume of gas passing through the dehydrator will be cut down, with the amount varying according to the condition of the unit. In turn, its service life and on-stream time will be proportionately prolonged.

Measuring tanks . . . As a means of checking the performance of individual dehydrators, a pair of calibrated measuring tanks are used to receive water removed from the units during a regeneration cycle. Heated gas is passed through the dehydrator to pick up absorbed moisture, and the water is condensed out of the stream and recovered in a water knockout drum. The overhead gas from the drum is then discharged into the absorber residue-gas stream for a pass through the dehydration system before entering sales. Meanwhile, water from the knockout drum is turned into the two calibrated tanks. Once the regeneration cycle has been completed, the amount of water collected is determined. It may then be used as a performance check against the calculated amount.

Editor's Note: This installment marks the halfway point in a series of articles presenting valuable on-the-job ideas now in use at Magnolia's Seeligson cycling plant. The first two installments covered various maintenance and instrumentation ideas. Future articles will cover these items: (1) butane cooling over a parallel arrangement of four chillers; (2) controlling pump unloading in the plant's waste-disposal system; (3) protecting plant's steam system against pressure drop; (4) minimizing loss of filter-bed charcoal in condensate filters; and (5) reclaiming lube oils for use in lubricators or crank cases.

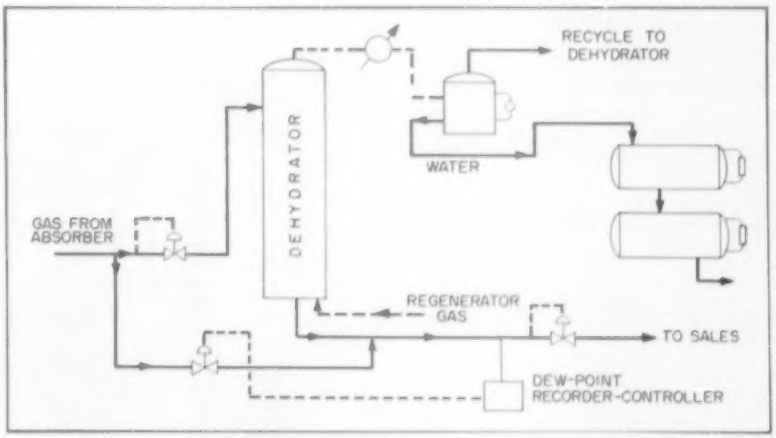


FIG. 1—This is how the dew-point recorder controller is worked into the sales-gas system through a bypass to prolong the service life of the dehydrating medium.

CHANGE SETTING IN SECONDS!

Type A Controller

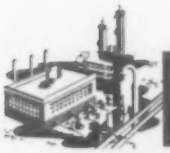
On The Versatile GUIBERSON TYPE A CONTROLLER

Adjustment for intermittent production at any given interval is just that quick on this Guiberson built unit. Lift the cover, set the adjusting screw at the point desired and the job is done. A series of fixed tabs on the revolving drum are spaced for different time cycles — five minutes, seven minutes, ten minutes, twelve minutes and other cycles that might be required. A broad range of injection intervals is provided, from a minimum of five minutes to a maximum of one injection per revolution of the two-hour clock. Accurate timing of the injection period is obtained by a simple screw and each cycle repeats with extreme accuracy. There are no loose pins or tiny adjustment parts — no special tools are required.

Extremely versatile, the same unit is easily adapted to continuous or intermittent gas lift production, purging, downsteam or up-stream pressure control of tubing or casing, tubing control, casing control, or combination tubing and intermitter control. In any of these applications the controller has a very low "on-off" operating differential. Pressure adjustments may be made very accurately, conveniently; and the control is positive. The entire unit is built of corrosion-resistant materials; is compact yet accessible, light but strong, extremely sensitive though sure in operation.

- 2″ Line Pipe Threads.
- Cast Steel Body.
- 3,000 psi Test Pressure.
- 1,500 psi Working Pressure.
- Stainless Steel Stem.
- "TEFLON" Stem Packing.
- "COLMONOY" Ball and Seat.
- Steel Drip Chamber with Monel Screen.
- Corrosion Resistant Materials in Controller Parts.
- Weather Proof Aluminum Cover.

THE
GUIBERSON
CORPORATION
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
Sold By Leading Oil Field Supply Stores Everywhere



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—2

Here's What Steam Is and How It's Used

STEAM is liquid water converted to a vapor by heating. It is used chiefly as a means of transferring energy from one point to another. In this it might be compared to the flow of electricity.

Steam is a powerful tool which has gained wide use in many industries, especially in petroleum refining. It can be divided into three classes: saturated; wet; and superheated. Saturated steam must be (1) in contact with the liquid water from which it was generated, and (2) at a temperature which is the boiling point of water and the condensing point of the steam.

Q. What characterizes the different types of steam?

A. Saturated steam is sometimes called "dry steam" because it is free from mechanically mixed water particles. For example, the steam which comes out of a tea kettle would be saturated steam. Wet steam is simply saturated steam containing water particles in suspension. Superheated steam is steam at any given pressure which has been heated to a temperature higher than the boiling point of water at that pressure.

Q. How is the temperature of saturated steam calculated?

A. The temperature at which water boils or steam condenses changes with the pressure. It is often desirable to know the temperature of saturated steam when only the pressure is available. This information may be found in steam tables. The following table lists the temperature of saturated steam at pressures common in refinery lines:

Pressure (lb. per sq.-in. gage)	Temp. °F.	Heat of evaporation (or condensation) B.t.u.'s per lb.
—10	159	1,002.5
0	212	970
5	227.5	960.5
20	259	939
50	298	911.5
55	302	908
125	353	868
150	366	857
225	397	828.5
400	448	776.5

The only reason for including the third column in this table was to call to your attention the fact that when 1 lb. of saturated steam is condensed, about 800-900 B.t.u.'s is given up.

Q. How do refineries use steam? In which types of equipment?

A. Refinery uses of steam may be divided into five classes: (1) as a source of work; (2) as a source of heat; (3) as an aid in the separation of some hydrocarbon mixtures; (4) as a cooling agent; and (5) as a fire-fighting agent.

1. Examples of steam as a source of work would be its use in turbines, reciprocating pumps, and compressors. Maximum work is obtained from the steam when it is expanded to the minimum possible pressure. However, this service normally uses only a small portion of the heat in steam. Exhaust steam, therefore, is a valuable source of heat in the refinery.

2. Examples of steam used as a source of heat include tank heaters, building heaters, heat exchangers, reboilers, tracing, gutting, and others. For this service the steam pressure is quite often of minor importance. However, the temperature of the steam used in heating must be such that there will be an effective difference in temperature between the steam and the substance heated.

Maximum heat quantity is obtained from the steam only when it is completely condensed. The 800-900 B.t.u.'s gained from condensation (only) of a pound of refinery steam is the largest portion of the heat available.

To illustrate this point, let's consider 1 lb. of 150-psig. saturated steam (366°). By allowing this pound to blow through a heater (with no condensation) and to drop to 0 psig. pressure and 212°, there would be about 45 B.t.u.'s given up. (Actually, the temperature probably would not drop this low.)

But if we just condensed this pound of 150-psig. steam, we would obtain 857 B.t.u.'s from it. And if we condensed it and then cooled the condensate to 212°, we would obtain 1,011 B.t.u.'s from it. (However, in most heaters the amount that the condensate can be cooled is negligible.)

From this example, it can be readily seen that the great majority of the heat is given up on condensation. Every effort should be made, therefore, to take advantage of this heat of evaporation by condensing the steam.

3. Stripping steam is used in the separation of some hydrocarbon mixtures. When used in this service, the steam aids in the physical separation of the lighter material, which rises with the steam and leaves the top of the stripper. The temperature and pressure of the steam ordinarily are not important in this service. However, the temperature of the stripping steam ordinarily is equal to or higher than the stripper-bottom temperature.

4. Steam is used once in awhile as a cooling agent. This occurs during periods of emergencies when steam is cut through a piece of equipment which runs hotter than the steam. The steam will keep the temperature of the metal down, but will not give it a temperature shock. The most common use is in furnace tubes when there is a failure of coil charge.

5. As a fire-fighting agent, steam is used both to lower temperature and also to cut off the supply of oxygen.

Q. Do small leaks cause much steam loss? How much?

A. Small steam leaks, if left unrepaired, mount up to a large loss in a month's time. The following table shows the amount of steam that can be lost from various leaks in a 150-psig. steam line.

Diam. of a round hole (in.):	Area per sq. in.	Steam lost, lb. per month
1/16	0.0031	18,700
1/8	0.0123	74,800
1/4	0.0491	299,200
3/8	0.1107	673,200
1/2	0.1964	1,196,800
1	0.7854	4,787,200

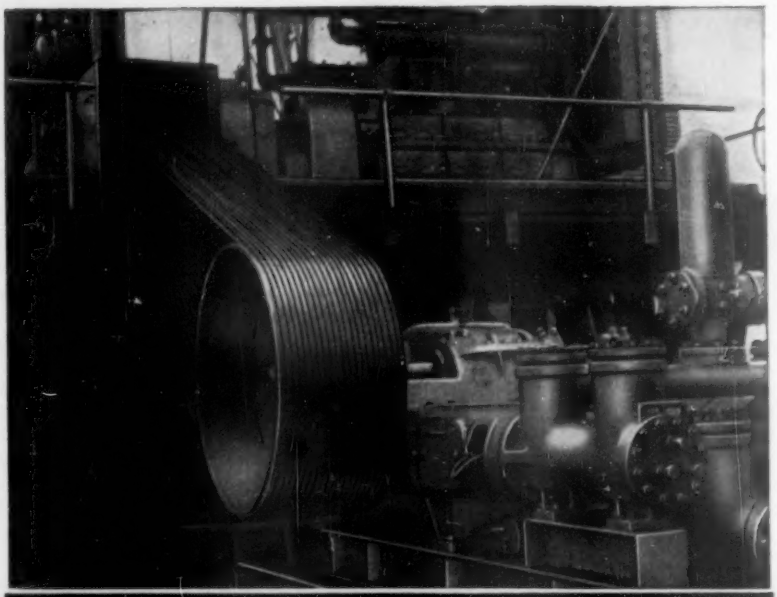
HOW TO BUY V-BELTS

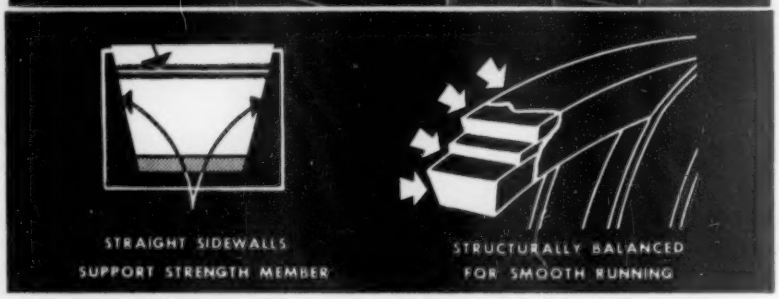
FOR TOUGH, RUGGED DRIVES

. . . and get "More Use per Dollar"

Look for a V-belt construction that assures long life under heavy loads, extra strength with the use of the correct strength member.

Higher rig floors and bigger pumps for deeper drilling demand longer, stronger V-belts. Belt strength members of super-strength cords should be correctly positioned in the neutral axis section of the belt so as not to stretch or compress unnecessarily as the other parts of the belt are flexed in use. Straight belt sidewalls help support the strength members in a straight line, permit all cords to pull equally . . . deliver their maximum share of power. The precision balance of *all* parts of the V-belt makes for a smoother running drive, controlled length of every belt in the set, and fewer matching problems . . . longer life with the heaviest power load. Specify by name the V-belt engineered to give you extra strength and extra pulling power for heavy duty drilling operations . . . specify Condor V-Belts.





CONDOR V-BELTS

R/M engineers have developed an improved Condor V-Belt especially to meet the demands of high powered deep drilling rotary rigs. The strength members in Condor V-Belts are made of super-strength synthetic cords . . . embedded at the neutral axis in heat dissipating Flexlastics to assure the smooth, internally cool running of every belt despite constant flexing around pulleys. Prestretching during manufacture removes inelastic stretch that might otherwise occur on the job . . . there are no laggards and no over-strained belts. Matching problems are further eliminated by special humidity protection and individual belt length is controlled. Straight rugged sidewalls grip the grooves with positive pressure for maximum power delivery. Heavy duty covers withstand wear and weather . . . protect the heart of the belt against premature failure. The long service life and uniform power delivery of every Condor V-Belt in the set means more productive operation of your rigs at lower costs.

Let an R/M representative show you how Condor V-Belts last longer on the most rugged V-belt drive . . . give you "More Use per Dollar".

RM 512 OF

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

Have Electrical Equipment Prices Risen?

by W. L. Nelson

The cost of electrical equipment seems to be higher. Have there been large increases in price?—S.H.J.

Although electrical equipment has increased in price, the increase is generally not as large as for basic materials such as steel or lumber. The cost of electrical equipment and most machinery has lagged behind the average by about 10 per cent. Meanwhile the cost of labor has risen more rapidly than that of material.

Changes since 1926 are indicated in Table 1. Current indexes of the five equipment items shown in Table 1 are published on the Cost-imating page of The Oil and Gas Journal each quarter.

The Electrical Machinery and Equipment Subgroup (Code 11-70) of the Bureau of Labor Statistics which is carried as electrical machinery on the quarterly Cost-imating page (January, April, July, and October) in The Oil and Gas Journal is composed of seven classes:

Code 11-72—Integrating and Measuring Instruments (7 items).
Code 11-73—Motors, Generators, and Generator Sets (15 items).
Code 11-74—Transformers and Power Regulators (5 items).
Code 11-75—Switchgear and Switchboard; Controls and Fuses (20 items).
Code 11-76—Arc Welding Machines and Equipment (8 items).
Code 11-77—Lamps (only 1 item).
Code 11-78—Batteries (6 items).

Actual prices for electrical equipment is not disclosed by the Bureau of Labor Statistics, but some 1946 information on costs is available in the following issues of the Cost-imating Series:

No. 30—Pump Materials and Drives, May 12, 1949, p. 121 (Motors).

No. 31—Large Motors (and Transformers), May 19, 1949, p. 363.

No. 32—Electrical Equipment (lines and miscellaneous), May 26, 1949, p. 115.

The prices given in these issues for the year 1946 can be converted to costs during other years by the indexes of Table 1, and to current prices by indexes in the quarterly Cost-imating issues.

TABLE 1—PRICE INDEXES OF ELECTRICAL MACHINERY AND EQUIPMENT BASED ON 1946*

	Electrical machinery Code 11-70†	Motors and generators Code 11-73	Transformers Code 11-74	Switchgear and switchboard Code 11-75	Arc welding Code 11-76	Wiring‡
1926	81					53
1928	79					58.5
1930	70					54.5
1931	63					57
1932	57					57
1933	58					57
1934	61					57
1935	64					64.5
1936	67					68.5
1937	71					71.5
1938	69					74.5
1939	69					78
1940	70					81
1941	74					84
1942	79					87
1944	81					93.5
1946	100	100.0	100.0	100.0	100.0	100.0
1947	122	126.3	122.9	120.7	122.0	106
1948	127.6	128.6	127.0	127.2	127.4	112
1949	130.9	128.7	129.7	132.3	130.5	117.5
1950	134.9	135.0	131.6	142.8	136.5	
1951	154.3	155.8	147.7	166.7	151.0	
1952	152.4	154.6	148.0	161.4	151.3	
1953	156.4	157.1	156.9	165.0	154.7	
1954	160.0	157.8	161.9	171.2	158.5	
Dec. 1954	160.5	155.7	161.9	171.4	163.5	

*Wholesale Price Index, U. S. Department of Labor, Bureau of Labor Statistics. †Marshall-Stevens Index, Chem. Eng., February 1949, p. 129, until 1948. ‡Wiring in commercial buildings, Section G, Subcommittee on Internal Wiring, A.I.E.E.

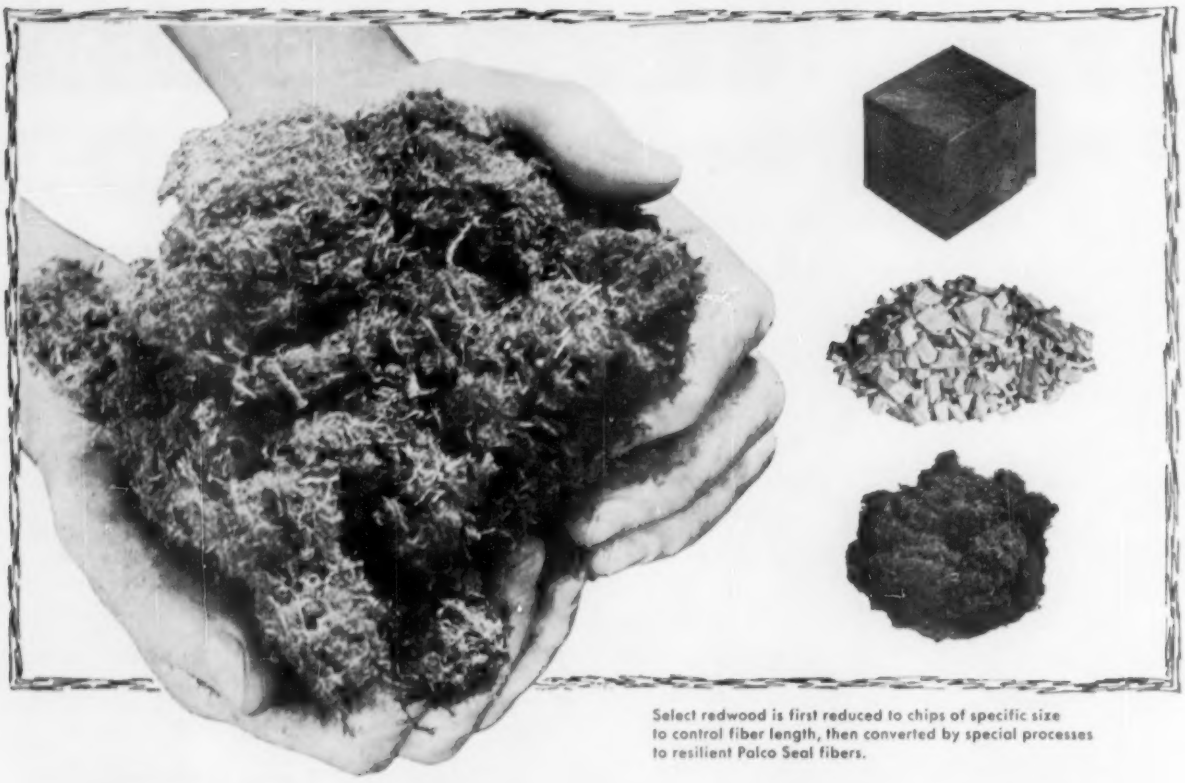
Blending Octane Number Of Platformate

How does platformate behave upon blending? Does it have a better octane number than by test, as does thermal gasoline?—F.S.G.

Scant published data (Bogan and Haensel, Platformate-Properties and Performance, fifteenth midyear meeting, A.P.I., Refinery division, Cleveland, May 4, 1950) do not provide a definite answer. In general it appears that the average behavior of platformate is neither better nor worse than its laboratory octane number. Only when blending with polymer gasoline (10 per cent) is the behavior clear. The polymer gasoline behaves as if it had an octane number 4 to 14 per cent better than its research octane number. In contradiction, if the motor method of testing is used, platformate exhibits a higher blending octane number (1 to 2 per cent higher than laboratory test) when mixed with polymer gasoline.

Likewise, thermal gasoline when mixed with platformate has a higher blending value (2-10 per cent) than its clear octane number if tested by the research method, but the reverse is true if the motor method of test is used.

A number of three-component blends were also tested and in nearly all cases the blends had slightly lower octane numbers than would be expected by arithmetic computations.



Select redwood is first reduced to chips of specific size to control fiber length, then converted by special processes to resilient Palco Seal fibers.

Greater sealing efficiency pays off in preventing circulating mud losses

The time required to establish an impregnable barrier, the amount of material used, and the permanence of caulking are important characteristics of preventive and corrective lost circulation materials. Low in price, Palco Seal has proved its economic advantages through meeting these requirements with greatest efficiency in field applications wherever thief formations and porous conditions exist.

Palco Seal's combination of long and short fibers mixes easily with mud, stays in suspension, and is carried immediately to loss areas. It quickly sets up a dense matted barrier which becomes embedded in porous strata and fissures or cracks. Because Palco Seal possesses the inherent qualities of the enduring redwoods from which it is derived, it is naturally resistant to rot or decay and offers a lasting caulk-seal.

Palco Seal is a *designed* product from a basically correct raw material . . . not an adapted by-product. Selected redwood is reduced to uniformly classified chips and exploded in steam digesters to form a uniform resilient fibrous material. Palco Seal is backed by over a decade of actual field use. For the most efficient prevention of loss of circulation in drilling operations, investigate Palco Seal.

Now available in loose-filled 40-lb. bags for easy handling. Also available in 80-lb. bales.

DEVELOPED THROUGH PALCO RESEARCH

WRITE FOR BULLETIN No. 4-02 describing the properties, operating advantages, and composition of Palco Seal.

Available through oil field and mud service organizations.

THE PACIFIC LUMBER COMPANY

100 Bush Street, San Francisco 4, California
35 East Wacker Drive, Chicago 1, Illinois

by R. I. Martin

ELECTRIC LOGGING—56

How the Laterolog Measures Resistivities

A MONOELECTRODE gives a log which shows good detail but is influenced unduly by effects of the mud column. The Laterolog retains this high power of resolution, and overcomes damping effects of mud by using focusing electrodes.

This electrode arrangement is shown in Fig. 1. Three pairs of connected electrodes A_1A_2, M_1M_2, $M_1'M_2'$ are symmetrical with central electrode A_0. A constant and measured current passes through electrode A_0. Additional currents feed through auxiliary-power electrodes A_1A_2. Intensity of these currents is automatically adjusted so that the potential difference between M_1M_2 and $M_1'M_2'$ is substantially zero. The potential at any one of these latter four electrodes is recorded. Apparent resistivity measured is proportional to the value of this potential and to a geometrical factor which depends on distances between the various electrodes.

Near the current electrodes, current flow is radial, as shown by small circles (four), indicating equipotential surfaces. As current flow lines become longer, interference takes place. These flow lines cannot cross, so they turn sharply and become parallel. As a result, the current which flows from electrode A_0 attains the shape indicated by the shaded area on Fig. 1. It is bounded by the interference between current flow lines from electrodes A_1 and A_0, and also from electrodes A_2 and A_0.

The equipotential surfaces take forms shown by broken lines 3, 2, 1.5, and 1. Their spacing, and the numbers 4 through 1, show the drop in potential with distance in a qualitative manner. Their shape becomes elliptical, and at larger distances will become spherical. That is, when the distance becomes large with respect to A_1A_2, the several electrodes will behave as a single electrode because their spacing is small with respect to distance.

The controlling effect of electrodes A_1A_2 is the same as if insulating plugs could be placed in the bore hole between M_1 and M_1' and also between M_2 and M_2', and these plugs could be extended horizontally through the formation as well.

Accordingly, current flowing from A_0 is prevented from flowing up or down the hole past measuring electrodes $M_1M_1'M_2M_2'$. The mud column therefore has little effect on results with the Laterolog. This is in contrast to conventional resistivity-logging devices. In fact, the Laterolog gives better results when the mud resistivity is extremely low.

If the device is opposite a thick bed, the current flows in a horizontal disk to great depth within the bed. The thickness of the disk is approximately equal to the distance between O_1 and O_2, the midpoints of M_1M_1' and M_2M_2'. The potential at any of the M electrodes is the drop in potential caused by ohmic effect of current flowing within this disk from the bore hole to large distances.

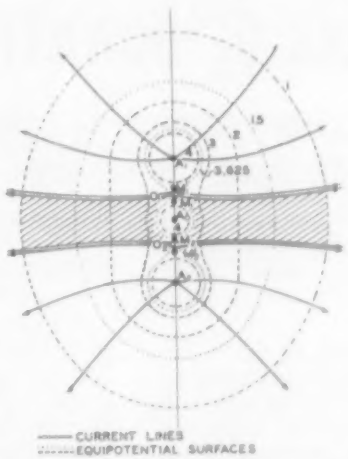


Fig. 1—Electrode arrangement with the Laterolog. The Laterolog has a high power of resolution and overcomes damping effects of the mud by using focusing electrodes. From Doll, "The Laterolog," Vol. 92, A.I.M.E. Trans. 1951.

The potential at electrodes M is therefore proportional to the resistivity of the medium.

To explain the operation in the case of thin beds, consider first a bed whose thickness is equal to O_1O_2. If the surrounding shale is one-tenth as resistive as the bed, the auxiliary currents from A_1 and A_2 are increased automatically to about 10 times what their value would be if the medium was homogeneous and equal to that of the bed.

This is necessary to cause the potential differences between M_1 and M_1', and M_2 and M_2' to be equal to zero. In this way the distribution of potential above and below the bed is made similar to what it would be in a homogeneous medium. So there is no tendency for the current within the disk to be attracted by the upper and lower less-resistive beds. The disk keeps its normal shape and produces a drop in potential through the bed which is the same as if the bed were considerably thicker. The apparent resistivity observed opposite the center of the bed is therefore very little different from the true resistivity.

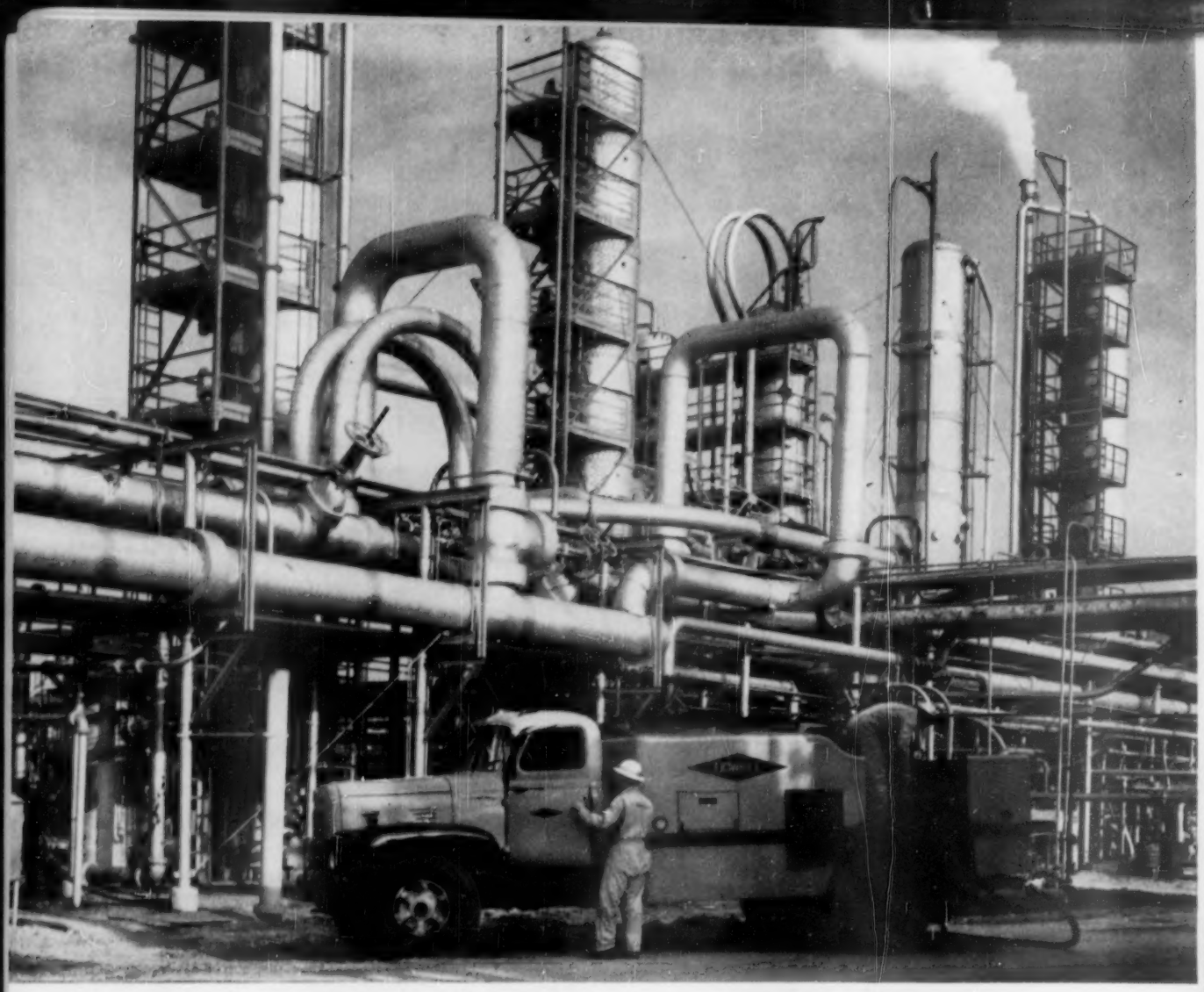
When the upper and lower formations are more resistive than the bed, the current is automatically decreased and an equivalent result is obtained.

If the resistive bed is thicker than O_1O_2, the current adjustment is less. And again, the apparent resisting is nearly equal to the true resistivity.

In the opposite case of beds whose thickness is less than the disk of current, the current from A_0 will be divided between the bed and the surrounding material. The proportion flowing in each will depend on the bed thickness and the respective resistivity values. Whatever the exact relations may be, the effect of less-resistive material will be to decrease the apparent resistivity. As the bed becomes thinner, the decrease becomes more rapid.

The Laterolog will give resistivities close to the true resistivity for beds equal in thickness to O_1O_2 or greater in thickness.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.



SIX DAYS OF DOWNTIME SAVED

Refinery tower cleaned chemically by Dowell in only eight hours . . . a six-day saving over mechanical methods!

A refinery operator had to shut down his H_2S stripper bubble cap tower every two months to remove an oily carbonate scale. Each shutdown took seven days, because of the mechanical cleaning methods used, and even then the tower was not thoroughly cleaned.

Dowell engineers were asked to tackle the problem. They cleaned the tower in just eight hours, using chemical solvents. Visual inspection showed the tower to be free of scale with all loose deposits washed from the caps and trays. The operator of this refinery was so impressed that he adopted a regular schedule of Dowell chemical cleaning.

Dowell chemical cleaning methods are designed to reduce costly downtime, because solvents are introduced through regular connections, keeping dismantling at a minimum. Liquid solvents can go wherever gases or condensates flow —to clean angles, bends and other irregular surfaces inaccessible to mechanical methods.

You can help to maintain maximum operating efficiency in your plant by arranging for a regular program of Dowell chemical cleaning. For full information, call your nearest Dowell office, or write Dowell Incorporated, Tulsa 1, Oklahoma, Department E-11.

chemical cleaning service for industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

by J. Brent Malin

LUBE-OIL ADDITIVES—3

REFINER'S NOTEBOOK

What Additives Can Do to Improve Lube Oil

IN many cases, detergents also perform the very important function of reducing corrosive wear. During combustion, considerable quantities of water and carbon dioxide are formed along with smaller amounts of sulfur, nitrogen oxides, and halogen compounds.

When cylinder-wall temperatures are low, these products of combustion condense and form acidic, corrosive materials which greatly increase the rate of piston ring and cylinder-wall wear. Basic sulfonate and phenate detergents are effective in neutralizing this acidic condensate and so in reducing wear. This subject is discussed further in a later section.

From an understanding of how detergents function, it can be seen that the additives are gradually depleted in service as they go about doing the job for which they were intended. In oil where substantially all of the additive has been consumed, it is possible through continued use not only to overload the oil with fresh contaminants, but also—by continued mechanical working—to rupture the bonds that hold the detergent to the old sludge particles. When this happens the sludge is free for deposition in the engine. When the bond is sheared in this manner it appears that something has been radically disturbed in the detergent molecule because the detergency properties are henceforth practically nonexistent.

Detergents are limited in what they can accomplish. They can neither make a poor base oil into a high-quality finished oil, nor wholly compensate for poor engine mechanical condition and operation. In such cases detergents become quickly overloaded and the harmful products begin to deposit on internal engine parts and plug filters.

Filterability . . . Detergent oils, under conditions of normal use, display considerably different filterability characteristics than nontreated oils. Since detergents tend to keep sludge and insoluble residues in such a finely divided state, the small contaminants can repeatedly slip through the pores of present-day commercial filters.

This elusive filterability is further aided by the oil-soluble ends of the detergent. They seem to lubricate the passage of the sludge particle and prevent its direct contact and probable sticking as might happen if the particle were not in the micellar state. There is very little of the agglomeration that occurs with nondetergent oils and which consequently makes them easier to filter. The oil becomes discolored. The new filter becomes discolored. But most of the sludge remains in a finely divided state to be drained and disposed of with the oil.

Filter life . . . As might be reasonably expected, if the sludge is drained with the oil there will be less retained by the filter. And that seems to be the case. Filter life with today's detergent oils is several times that formerly thought to be acceptable. So it is not uncommon to find filters being used through several oil changes.

An exception to this comes from engines that have been used in low-duty, cold-type operations. As previously mentioned, the insolubles formed under these conditions are not held in suspension too well by detergent additives. Consequently, most of them can be trapped by an efficient oil filter.

The successful functioning of detergent additives—which, in turn, is the only means of securing successful engine operation in many critical types of service—is dependent upon the polar nature of the detergent molecule. Should anything interfere with the polarity, surface activity is lost and the detergent molecule is unable to attach itself to a sludge particle. The oil would then function as a straight mineral lubricant and engine operation in critical service would be unsatisfactory. Similarly, anything which withdraws or adsorbs the additive—such as filters filled with activated clay, charcoal, or silica—will return the oil to essentially its nondetergent state.

Rust or Corrosion Inhibitors

Petroleum oils usually are considered to be effective rust and corrosion preventives under the conditions normally encountered in engine operation. For unusual conditions, such as long storage periods, infrequent operation, or high humidity, additional protection is required.

The demand for such protection was especially sharp during World War II. So a class of compounds was used which included the sodium salts of petroleum sulfonic acids, degras from sheep wool, and esters of naphthenic acids.

A second class of additives which also imparts antirust characteristics is the petroleum sulfonates which are frequently employed as detergent additives. In general, the neutral sulfonates are better antirust agents than the basic sulfonates. But the latter have the ability to neutralize acids.

Rusting . . . This is caused principally by condensation of moisture. It collects first on the oil-coated surfaces of the engine, and then penetrates the protective oil film and contacts the metal surface. At this point the condensate begins to attack and corrode the metal. Then the attack spreads beneath the oil film, gradually causing it to rupture and break away. This process can continue until the entire surface is being attacked by rust.

Corrosion inhibitors, or antirust materials are believed to function in somewhat the same manner as do film-strength improvers and detergent compounds. The materials contain polar molecules that tend to attach themselves to metallic surfaces. The remainder of the molecule does not attach to the metal, but rather remains suspended in the oil film. Thus, when moisture condenses upon such a surface, the liquid droplets rest upon the "tails" of the inhibitor molecules while the "heads" of those molecules remain firmly attached to the metal surface. This attachment is generally strong enough to prevent the liquid from displacing the molecules, so the droplet rests upon the rust-preventive film and never has the opportunity to attack the surface.

Author is with E. I. du Pont de Nemours & Co., petroleum chemicals division.

Is Good Rig Housekeeping Important?

ONE of the things of which a good driller is proud is that his superiors and fellow drillers call him "a good rig housekeeper"—remark that his rig is clean and neat and "picked-up." That the floors, the walkways, the platforms, the mechanical equipment, the doghouse, the lights, the lockers, the stairways are spick and span—"a place for everything and everything in its place."

Proud? Of course he is! Why shouldn't he be?

But there is a still deeper reason for pride in an orderly rig. An orderly rig bespeaks an orderly driller—one who thinks clearly—one well in command of his job—a good manager—a natural leader who inspires pride in his crew—a real pivot man whose results in terms of quantity, quality and low cost are nothing to be ashamed of.

Let's look into that a little.

For one thing, a clean, well-painted rig on which to work attracts a better class of workers. And other things being equal, holds them longer.

For another thing, a clean, orderly place to work reduces fatigue and thus again makes for better production. It is a fact that tests show that such a "little thing" as dirty light reflectors actually reduce efficiency from 20 to 60 per cent—and that the average open-type reflector loses 10 to 25 per cent of its light-reflecting ability in four short weeks.

Think, then, how dirty, greasy, sticky machinery must slow up even a good man. Or how much a cluttered-up floor, where a worker has to be continually stepping over things, must annoy him, hinder his progress—and run up your cost per unit! Disorder disorganizes faster than the best driller who ever lived could organize.

A few bigger reasons . . . A third reason why a clean rig contributes to a driller's good record is that it is a rig almost entirely free from fire. It's almost entirely free from fire because it is almost entirely free from fire hazards—rubbish, oily rags, and other flammable materials which offer such wide-open invitation to property damage and injury to workers—if not to loss of life itself.

A fourth reason why a clean rig is profitable, is that it is not a wasteful rig. That is particularly true as regards the piling and handling of material.

For instance, sacks of chemicals for mud piled in the mud house in a heap take up considerably more space than if they were stacked in piles. Moreover, it takes longer to sort or count them, or make a selection, and the number of sacks damaged or torn open is likely to be much greater.

And a fifth reason why good housekeeping pays a driller is that it makes his rig a safer one. It is with this aspect of the housekeeping problem that we are concerned here.

Keep walkways clear . . . "I went to the trouble," says a Gulf Coast steam rig operator, "of bordering all board walkways with white lines. Then I sold the crews on keeping the walkways clear—not allowing anything to be laid or stacked on them. I not only pointed out the stumbling hazard, but also stacked some old pipe across one walkway to show the crew how this would slow us up and cost money. After I thought I had made my sale, I kept my weather eye on the walkways for a while, reminded a few 'forgetters,' and today I have no more trouble of that kind!"

Now let's inspect a rig operated by a careless housekeeper. On the monkey board are two loose wrenches. One or both of them may drop off and either hit a crew member on the head or fall into the equipment. And over there at the base of the draw works, look at that assortment of loose fillings! Fifteen minutes work would eliminate any danger of a man falling over it. But, apparently the driller has other things to think about.

Over beside the engines is a puddle of oil. Some worker's feet are going to fly out from under him when he steps on that spot. He'll be laid up at home a few days with a wrenched back, while some "weevel" struggles along with his job. Oh, well!

Good piling . . . Materials are often piled on a truck so carelessly that the load falls off and injures nearby workmen. Trucks should not be overloaded. Neither should the load be top-heavy. Furthermore, if the load projects, it may strike and injure someone or it may catch on adjacent objects and pull them and itself over

Good housekeeping eliminates practically all accidents caused by stepping on nails and other sharp objects. Nevertheless, a good driller makes it a rigid policy to have all projecting nails removed from boards, or the boards burned. Glass, scraps of tin, sheet metal, and the like, should be picked up and disposed of, and other sharp objects properly piled or otherwise cared for.

But clean rig floors, unobstructed walkways and stairways, guarded platforms, and proper piling are not all. Good housekeeping also includes clean machinery. In this connection, a wide-awake driller can obtain valuable suggestions from National Safety Council publications. Let's quote from one of them!

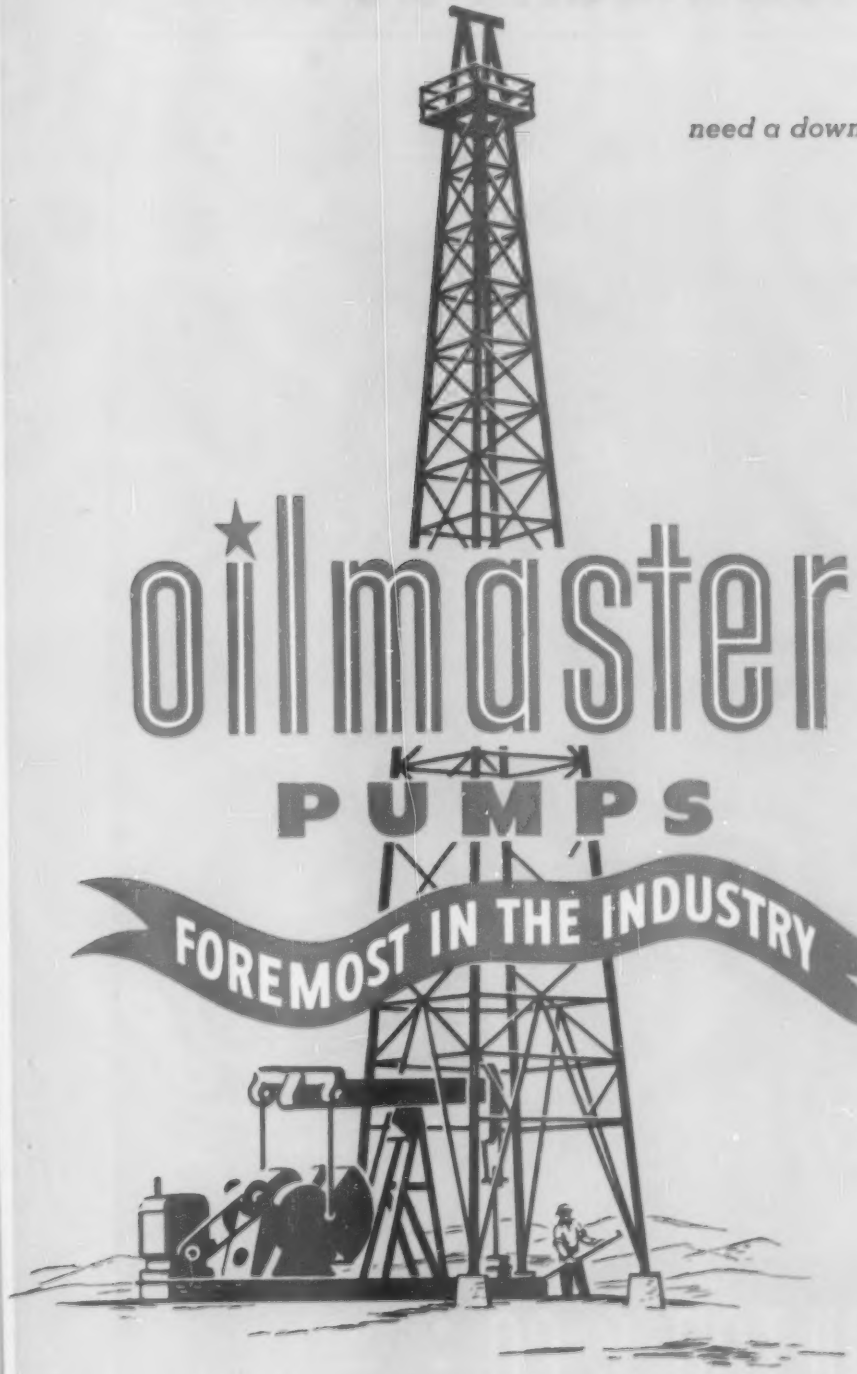
Cleanliness at the machine . . . "Cleanliness of machines and other equipment is particularly important.

"Equipment covered with grease and oil is dangerous to work around. Where grease and oil collect on a machine, the floor usually becomes soaked, thus increasing both the fire and accident hazards. Furthermore, dirty machines are responsible for greater repair bills and an increased amount of 'scrap.'

"On many rigs, dismantled or discarded tools and small items of equipment are allowed to take up valuable space on the rig floors. They collect dirt, become unsightly, hamper the men's movements, slow up traffic, and tend to encourage workers to leave other unused objects about the rig. If discarded equipment is not junked, it should at least be removed and stored in some place suitable."

From the A.A.O.D.C.'s booklet Safety and the Driller.

WE HAVE HESITATED TO SUGGEST...



that an oil well might need a downwell compressor instead of a downwell pump...

but we have become increasingly aware of the limitations of a single acting displacement pump for wells that must produce many thousand cubic feet of gas along with the daily production of oil. Solution...

For once, the long, slim shape required of a downwell pump worked to our advantage. We simply replaced the pull rod with a long hollow polished rod, and terminated the top of the pump barrel with a short packoff barrel closely fitted to the hollow rod. Then by adding an extra traveling valve to control the fluid flow through the hollow rod, we had the hybrid we were after—a compounded pump that would act as a two stage compressor on gassy fluids.

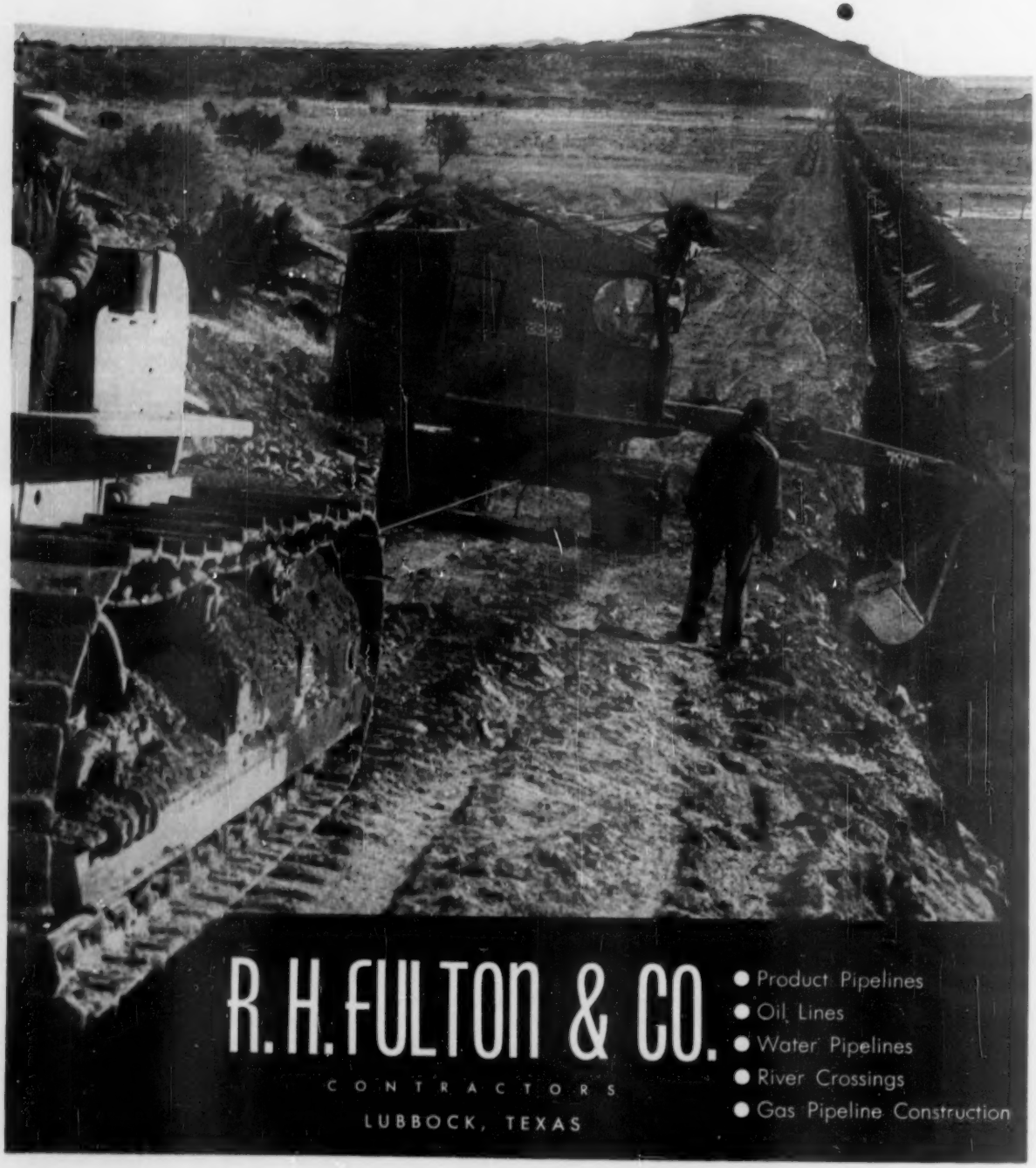
The combination achieved some interesting results. With the top of the plunger protected from the high pressure fluid in the tubing, the pump couldn't pound fluid. The fluid load on the hollow polished rod did the necessary work of compressing the gas and transferring the fluid from the pump barrel to the annular chamber on the downstroke, and in addition it kept the rods in tension.

We could go on — lower load range on the rods meaning lower torque on the unit gear box and less horsepower from the prime mover. No more gas lock meaning more uniform production, less destructive heat converted in the pump. But we suggest if you are interested in more efficient operation than you can obtain from a conventional pump in gassy or foamy wells that you get in touch with your Oilmaster representative and learn all about the

oilmaster
RATIO-COMPOUND PUMP
Patents Applied For

FLUID PACKED PUMP COMPANY, P. O. Box 64 • Los Nietos, California
Main Office and Plant, Los Nietos, Calif. • Dist. by the National Supply Co., Pittsburgh, Pa. Export: The National Supply Co., Inc., Export Division, 600 Fifth Avenue, New York • Co-Distributors: Berry Supply Store, Beacon Supply Co., Industrial Supply Co.

ACROSS THE CONTINENT. . . . .



R. H. FULTON & CO.

CONTRACTORS

LUBBOCK, TEXAS

- Product Pipelines
- Oil Lines
- Water Pipelines
- River Crossings
- Gas Pipeline Construction

Pipeline Patrol

. . . Report on Construction

Cities Service in Routine "Pigging" Operation

Cities Service Gas Co. is pictured doing a routine "pigging" operation on its Hugoton-Kansas City 26-in. natural-gas line. The shot was taken approximately 23 miles east of the company's Hugoton station. The valve is a 26-in. full-opening type and is secured by concrete footing to withstand the weight.

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

Ar-Mex Pipe Line Co.—Company has applications for two lines before the Office of Defense Mobilization Board for rapid amortization approval.

1. A crude-oil line from Albuquerque, N. M., to Phoenix, Ariz. This line would serve a 20,000-bbl. refinery being planned by Frost & Associates of Dallas.

2. A crude-oil line from Guernsey, Wyo., to Albuquerque.

• **Big Horn Pipe Line Co.**—Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

• **Butte Pipe Line Corp.**—This joint venture of Shell Pipe Line Corp. and Murphy Corp. has announced plans for a 450-mile, 16-in. line from eastern Montana to Wyoming. The line will deliver to big-inch carriers which start in eastern Wyoming.

Magnolia Petroleum Co.—Company has let contracts on 215-mile, 12, 14, and 16-in. crude line from Midland to Corsicana, Tex. O. R. Burden Construction Corp. has the western half of the line and H. B. Zachry Co. has the eastern half. Work is scheduled to be finished by October.

Magnolia Petroleum Co.—This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

• **Malco Pipeline, Inc.**—Company is planning a 40-mile, 4-in. line from South Blanco Tocito field in Rio Arriba County, New Mexico, to Bloomfield, San Juan County, New Mexico. Completion set for 1955.

Skelly Oil Co.—Company started work this month on 27½-mile, 12-in. line from El Dorado, Kans., to Harvey County, Kansas. Completion is set for May.

Standard Pipe Line Co.—Company plans to build two crude lines. Applications are now before the Office of Defense Mobilization for rapid amortization approval.

1. A 350-mile, 16-in. crude line from Glendive, Mont., to Guernsey, Wyo., to connect with Platte Pipe Line Co.'s system there.

BETTER, FASTER, SAFER,
plug valve lubrication
WITH DELTA FITTINGS

The grease fitting on a plug valve is a small, unnoticed item, until it becomes defective—then it becomes a mighty mite. A bad fitting can injure a man, ruin a valve, or be responsible for serious loss in case of emergency. That's why you should standardize on DELTA FITTINGS—with double-check valves, one-piece steel bodies and guaranteed not to leak at 15,000 lbs. pressure. No gaskets to wear or loosen causing leaks and locked couplers. And—DELTA is the only company that offers grease gun fittings for ANY lubricated plug valve.

The DELTA High Pressure GUN

Develops 10,000 lbs. pressure. Barrel tested to 30,000 lbs. Fast, positive prime, handles heaviest lubricants.

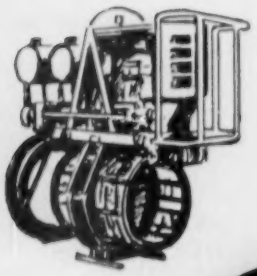
Get this CATALOG

Valuable, specific information on Delta Fittings, Gun, Automatic Lubricator, and Delta-Desco Lubricants for any valve service.

DELTA ENGINEERING SALES CO.
804 Louisiana Ave. Shreveport, La.
Sales Offices in All Principal Cities

DESCO
Plug Valve
LUBRICANTS

from this modern plant comes the world's finest PIPELINE EQUIPMENT



At Crose — The most modern tools — the most experienced craftsmen, produce America's most rugged pipeline equipment. Years of dependable service are built into every piece of Crose Equipment.

Designed by pipeliners—built by pipeline equipment specialists . . . that's why it is outstanding on pipeline construction jobs everywhere!

m. j. Crose Manufacturing Company, Inc.

2715 DAWSON ROAD • PHONE 6-2172 • TULSA, OKLAHOMA

14693 EAST COLFAX AVENUE, AURORA, COLORADO • 500 FIFTH AVENUE, NEW YORK CITY

DISTRIBUTORS: CROSE-CURRAN LTD., EDMONTON • CROSE PIPELINE EQUIPMENT CO., INC., NEWARK, N.J.
PIPELINE SUPPLY CO., HOUSTON

Pipeline Patrol

2. A 330-mile, 16-in. crude line from Wink, Tex., to Albuquerque, N. M. This line would serve a 10,000-bbl. refinery being planned by Frost & Associates of Dallas.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes, Wash. The $2,750,000 job will begin in spring and end July 31.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

• **Keystone Pipe Line Co.**—Company has ODM writeoff of 25 per cent for $1,875,000, 48-mile, 8-in. products line from Boot, Pa., to the Fullerton, Pa., terminal.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Okan Pipe Line Co.—This subsidiary of Warren Petroleum Corp. has awarded work to two contractors for its L.P.G. line from western Oklahoma and Kansas to Tulsa. Vaughn & Taylor Construction Co. has 260 miles of 3 to 6-in. gathering lines, and R. H. Fulton has 140 miles of 6-in. transmission line from western Oklahoma into Tulsa.

• **Products Pipe Line Co.**—This subsidiary of Goliad Corp. has received a fast writeoff for 40 per cent of $126,000 and 25 per cent on $1,781,000 for L.P.G. line from the Wilcox natural-gasoline plan in Lavaca County, Texas, to Texas City. Panama-Williams Co. has contract. Completion scheduled for midsummer.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job to be completed in June.

Sioux Oil Co.—Company will build a 55-mile products, 8-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D.

Southern Pacific Pipe Lines, Inc.—This subsidiary of Southern Pacific Railroad Co. has announced plans for 800 miles of products line from Los Angeles to El Paso. Line sizes are 16-in. from Los Angeles to Colton, Calif., 12-in. from Colton to Phoenix, Ariz., and 10 and 8-in. from El Paso to Phoenix. Products will be pumped both ways into Arizona.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles of 8-in. under way from Haines northward through Yukon to Fairbanks, Alska. Williams Bros., McLaughlin, Inc., and Marwell Construction Co. are doing the work. Pipeline work completed. Line will go into operation about May 26.

Natural-Gas Pipelines

• **Alabama-Tennessee Natural Gas Co.**—Company has proposal before FPC to lay 21 miles of 12-in. line west from its present line in Colbert County, Alabama.

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Louisiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000. FPC approved.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

• **Atlantic Seaboard Corp.**—Company has filed with FPC for permission to loop 84 miles of its existing 26-in. line in West Virginia, Virginia, and Maryland.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to

LASTING ECONOMY

"DO-NUT" Wm SEAL CASING BUSHING

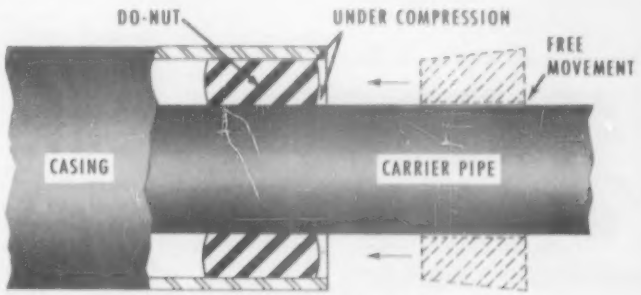
EASY INSTALLATION:
TAPERED O. D. OF DO-NUT IS DRIVEN INTO CASING END

SIZES: 6" PIPE AND SMALLER

STANDARD FOR DISTRIBUTION AND GATHERING LINES . . .

The DO-NUT Bushing, a solid, massive ring of synthetic rubber, slides easily over carrier pipe; THEN as tapered o. d. is driven into casing end, the flexible synthetic rubber compresses against pipe and casing forming a WATER TIGHT SEAL.

- A MINUTE TO INSTALL
- NO WELDING REQUIRED
- NO METAL INVOLVED
- WATER TIGHT
- POSITIVE INSULATION



T. D. Williamson, Inc.
P. O. BOX 4038 TULSA 9, OKLAHOMA

REPRESENTATIVES: Houston • Pittsburgh • Kenilworth, N. J. • Amarillo • Casper • Provo, Utah • Joliet, Illinois • Los Angeles Oakland • Bartlesville, Okla. • Edmonton • London, Ontario • Calgary • Buenos Aires • Durban, Natal, South Africa

Technically TOPS
★ ENGINEERING and CONSTRUCTION OF gasoline & industrial plants, gas compressor and oil pump stations and water flood units
★ Talk to TULOMA.... real help on oil and gas construction problems
Call . . 3-4113 . . Tulsa
by TULOMA
BUILDERS, INC.
105 N. BOULDER • TULSA, OKLA.

Pipeline Patrol

construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **City of Dalton, Ga.**—Proposes to build 39 miles of 8-in. from a point of interconnection with Southern Natural's Rome-Calhoun transmission line. Estimated cost: $2,940,000.

• **Clinchfield Coal Corp.**—Company has filed permit with Federal Power Commission for authority to build 16-mile, 12-in. line from Dickenson County, Virginia, to near Osborne Gap, Ky. The company is primarily a coal producer.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

• **Colorado Interstate Gas Co.**—Company has received recent FPC permission to change an application already approved by the commission. The company had planned to build 365 miles of 22-in. natural-gas line from Pacific Pipeline Corp.'s system at Rock Springs, Wyo., to Denver, where Colorado-Wyoming Gas Co. would pick it up. The line would have gone southwest of Laramie, Wyo. As now authorized, the line will be relocated to pass near Cheyenne, Wyo., and then to Denver. Deliveries will be made to Colorado-Wyoming near Cheyenne and at Greeley, Colo. The project will cost $24,146,821.

Colorado Interstate Gas Co.—Company is also spending $4,200,000 extending its gathering lines in the Panhandle of Texas, Oklahoma, and Kansas. Work will be done this summer.

• **Colorado-Western Pipe Line Co.** — 454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay, and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

East Ohio Gas Co.—Company has let contract to Williams Brothers Co. to lay 112 miles of 30-in. from Maumee, Ohio, to Cleveland. Completion is set for October 1.

• **El Paso Natural Gas Co.**—Company has future plans for a 370-mile, $35,000,000 line from Mountain Home, Idaho, to Reno, Nev. The company will buy the gas from Pacific Northwest Pipeline Co.

• Company plans to build 74 miles of natural-gas line and 6,925 additional compressor hp. in Texas, New Mexico, and Arizona. The cost will be $13,869,017. FPC approval received.

Empire Southern Gas Co.—Company is laying 36 miles of 6, 4, and 2-in. gas line near White Deer, Tex. Job is slated to be completed May 1.

• **Hope Natural Gas Co.** — Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo county line, West Virginia. Estimated cost: $930,000.

• **Houston, Texas Gas & Oil Co.**—Company plans to build 600 miles of 30-in., and 350 miles of 18-24-in. line to carry natural gas from Baton Rouge to Miami. Line will join with Coastal Transmission's proposed line from McAllen, Tex.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Lone Star Gas Co.**—Company plans to spend more than $7,000,000 building natural-gas lines from Snyder and Petrolia, Tex., to Fritch, Tex. The company proposes to sell the gas there to Natural Gas Pipeline Co. of America.

• **Michigan Consolidated Gas Co.** — 25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Gas Storage Co.**—Company has applied to FPC for permission to construct 36 miles of 16-in. natural-gas line from Mount Pleasant Junction to Milwaukee, Mich. The project will cost approximately $2,572,000.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

• **Natural Gas Pipeline Co. of America.**—Company plans to start work in July on 350 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex. Job expected to be completed by December.

• Company also plans to start 31 miles of 36-in. in July from Herscher, Ill., to a connection with Texas Illinois pipeline near Joliet, Ill. Job slated to be finished in November.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **New York State Natural Gas Corp.**—Company plans to start laying in June 18 miles of 20-in. pipe from Homer, Cortland County, New York, to its station in Otisco, Onondaga County, New York.

• Company also has plans for 21 miles of 20-in. from Genessee Falls, Wyoming County, New York to York, Livingston County, New York. No definite starting or completion dates announced.

• **Niagra Mohawk Power Corp.**—Company plans no major transmission lines for 1955. However, itp lans to add more than 300 miles of distribution mains.

• **North Indiana Fuel & Light Co.** — Company has awarded H. L. Gentry Construction Co. 30 miles of 10-in. and 15 miles of 6-in. natural-gas lines. Work will be completed near the middle of June.

• **Northern Natural Gas Co.**—Company has the following jobs before the FPC for approval.

• Canadian Extension—188 miles of 24-in. from Canadian border to near Wahpeton, N. D. 215 miles of 30-in. from Wahpeton to Farmington, Minn.

• South Dakota Extension—94 miles of 12-in. from Sioux Falls to Waterton-Huron. 71 miles of 10-in. from Waterton-Huron to Duluth-Superior.

• Duluth-Superior Extension—167 miles of 24-in. from Farmington to Duluth-Superior.

• **Northwest Alabama Gas District.** — 40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

Pacific Gas & Electric Co.—Company is working on 18 miles of 12-in. from Beehive Bend field to W/O Gridley in California. The job is slated for completion in September.

• Company plans 21 miles of 16-in. line from Marysville to Lincoln, Calif. Job will start in June and wind up in September.

• Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash. Approved by FPC.

380 miles, proposed, laterals and spurs off

Pipeline Patrol

main line to Pocatello, Idaho, to Yakima, Wash.

• **Panhandle Eastern Pipe Line Co.**—Company has plans to loop Peoria lateral before FPC now. The line would be 16-in. pipe running 58 miles from near Springfield to Peoria, Ill.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000, although later figures have been much higher than this.

South Georgia Natural Gas Co.—Company has let contracts on work approved by the FPC in 1954. The total cost of the projects is nearly $9,000,000.

Buchanan Pipe Line Co. has 85 miles of 3, 6, and 8-in. line in the State of Georgia.

Hallmac Construction Co. has 97 miles of 10-in. line from Albany, Ga., to Ellaville, Fla.

Mid-States Construction Co. has 110 miles of 2, 4, 6, and 12-in. line in Alabama and Georgia. Seventy-one miles of the line is 12-in. from Phenix City, Ala., to Americus, Ga.

Thomason & Associates, of Montgomery, Ala., has 35 miles of 12-in. and about 8 miles of smaller in Alabama and Georgia.

Tennessee Gas Transmission Co.—Company has awarded Oklahoma Pipe Line Constructors 113 miles of 24-in. natural-gas line from near Covington to Laska-Waxen, Pa. The work has started.

Company has also awarded H. C. Price Co. 130 miles of 24 and 26-in. pipeline in Ohio and Pennsylvania.

• Company has also received FPC permission to construt a 30-in. line, 370 miles long from Agua Dulce, Tex., to Kinder, La. The line will cost $35,400,000.

• **Texas Eastern Transmission Corp.**—Proposed, 382-mile, 24-in. line from Kosciusko, Miss., to Beaumont, to connect with the existing 30-in. line there to Connellsville and replace the "Little Inch" in moving natural gas. The project will cost $71,000,000.

• **Texas Gas Corp.**—This firm will spend $3,500,000 on a line from Orange, Tex., to a connection with a new line of Transcontinental Gas Pipe Line Corp. in Cameron Parish, Louisiana. The project will call for crossing the Sabine River, building a compressor station, and a measurement station.

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in.

Company will loop 14 miles of 20-in. at Haughton, La.

Will build 72 miles of 12-in. from Hardinsburg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedford.

From Bastrop, La. to Clarksdale, Miss., the company will lay 50 miles of 30-in.

From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20 in.

Transcontinental Gas Pipe Line Corp.—Company has awarded the following contracts to lay 315 miles of 36-in. and 219 miles of 30-in.

O. R. Burden Construction Corp. will lay 5.31 miles of 36-in. and 25 miles of 30-in. in Louisiana.

Associated Pipe Line Contractors, Inc., will lay 63 miles of 36-in. in Louisiana and Mississippi and 71 miles of 30-in. in Virginia and Maryland.

Midwestern Constructors, Inc., will lay 14 miles of 30-in and 54 miles of 36-in. in Alabama and Georgia.

Western Constructors will lay 77 miles of 36-in. in Georgia and South Carolina.

Panama-Williams Co. will lay 36 miles of 30-in. and 31 miles of 36-in. in South Carolina and North Carolina.

Williams Brothers Co. will lay 72 miles of 30-in. in Virginia.

United Gas Pipe Line Co.—Company has started work on 14 miles of 12-in. from Pescadito Junction to Laredo, Tex. Job will be finished June 1.

• Company has applied to FPC for permission to construct 63 miles of 16 and 20-in. natural-gas line in Mississippi, Alabama, and Florida. The company will also add 330 hp. to its compressor stations. Cost for the job will be about $8,300,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Wilcox Trend Gas Gathering System, Inc.—Company is spending over $1,000,000 building gas-gathering lines and compressor stations in the Cuero-Goliad area of South Texas.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Compania Shell De Venezuela.—Company will build a pipeline from its Block I field off the western shore of Lake Maracaibo to its terminal at Palmarejo. The line will be known as "Lapline" and will run 18 miles in the lake and 27 miles on land. The underwater section will be 16-in., and the remainder will be 24-in. Under construction.

• **Peace River Oil Pipe Line Co., Ltd.**—Company has been granted a permit to lay a 106-mile line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project will include a 16-in. line from Sturgeon Lake to Iosegun Lake and a 12-in. line from there to Edson. Capacity will be 58,000 bbl. daily.

• **Petroleos Mexicanos.**—145 miles, 12-in. considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

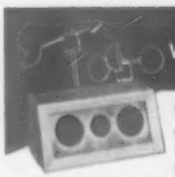
• **Standard - Vacuum Oil Co.**—Company has long-range plans for a 90-mile pipeline to give the new Lirik field in Central Sumatra an outlet. Completion is not scheduled before 1957 or 1958.

Texas Petroleum Co.—Contract has been let to Foster Wheeler Corp. and Panama-Williams for a 119-mile, 12-in. crude line to move oil from Velasquez field in Colombia to a connection with the main Andian National system at Galan. Est. cost: $6,000,000. Completion set for May.

Yacimientos Petroliferos Fiscales Bolivianos—Williams Brothers Co. is winding up work on a 6-in. line from Camiri field to Yaciuba on the Argentina border. The line is expected to be completed by May.

Williams Brothers also has contract to build a 230-mile, 6-in. products line from Cochabamba-Oruro-La Paz. The line will cost approximately $7,000,000. The Bolivian Government will eventually add a 10-in. products line from Oruro to Arica, Chile.

• **Others.**—For plans for further crude lines in Canada that have not yet been fully formulated, see The Oil and Gas Journal, April 4, page 79.



Weather affect your operations? Use Windometer, anywhere, available for AC or battery operation. Accurate facts instantly on wind direction and speeds to 85 mph, temperature from −40° to 120° F.

Beautiful natural finish blonde wood inside indicator cabinet plus outside transmitter unit as shown, only **$99.50**

Get "inside" information on the weather! Send check or money order for $99.50 or ask for free booklet.

"Aviation's Leading Supply House"
AIRCRAFT COMPONENTS, INC.,
Benton Harbor 12 Mich.

S. E. HUEY & CO.
ENGINEERS & SURVEYORS
HENINGER BLDG.
MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

Write or Wire
for Monthly Stock Lists

VALVES
PRESSURE TUBING
STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

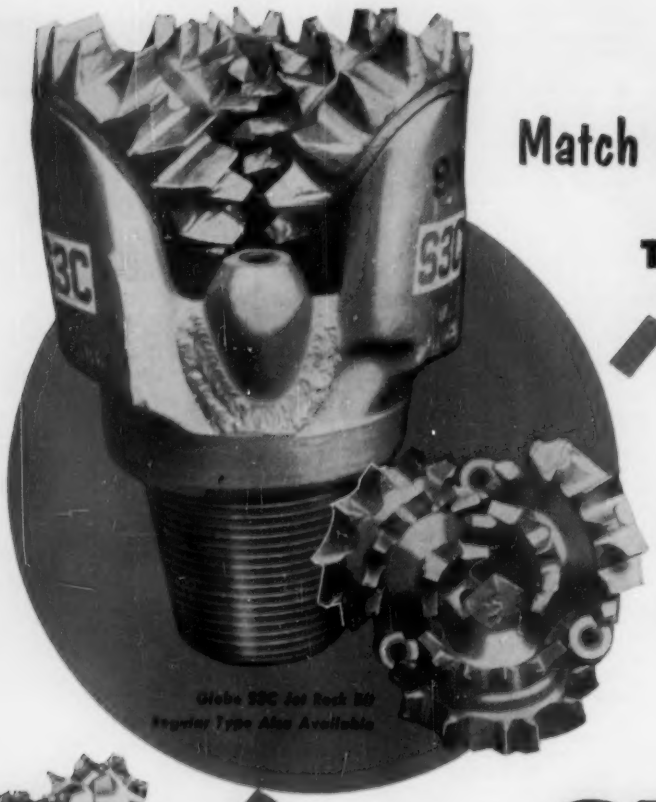
FLANGEKLAMP
the SURE GRIP Seal

WHEN SHIPPING PIPE or VALVES . . .

Protect your inside pipe and valve surfaces, both flanged and straight end, with "Flangeklamp" all metal end protectors.

- ALL METAL
- EASY TO INSTALL
- RE-USABLE

FLANGEKLAMP CORP.
80 LESLIE STREET • BUFFALO 11, N. Y.



Globe S3C Jet Rock Bit
Regular Type Also Available

Match the Drilling Bit

TO THE FORMATION and the DRILLING EQUIPMENT

Globe S2C Jet Rock Bit
Regular Type Also Available

Globe S4C Jet Rock Bit
Regular Type Also Available

GLOBE

ROCK BITS

2-CUTTER • 3-CUTTER • 4-CUTTER

Regular or Jet

Now you can select the Globe Rock Bit that most profitably meets YOUR individual well conditions. Whether your drilling equipment is best adapted to regular or jet drilling . . . in hard, medium or soft formation, Globe offers a complete selection of rock bits . . . regular or jet . . . in 2, 3, and 4-cutter models.

Experience a new standard for economical, profitable oil well drilling . . . specify GLOBE ROCK BITS.

GLOBE
OIL TOOLS COMPANY
GLOBE
OIL TOOLS

Main Office and Plant: LOS NIETOS, CALIFORNIA

Branches are located in all principal drilling areas.

Among the Drilling Contractors

Full Program Set for Drilling Safety Clinic

More than 250 top drilling men, both management and field personnel; oil company and contractor safety directors; and allied industry leaders will meet at the Baker Hotel in Dallas Thursday and Friday, this week, for the drilling industry's tenth annual safety clinic sponsored by the American Association of Oilwell Drilling Contractors.

Drilling contractors will be represented on the 2-day program by W. W. Duncan, Loffland Brothers Co., Tulsa; John S. Jackson, Rowan Drilling Co., Inc., Fort Worth; Warren A. Hirsch, Delta Gulf Drilling Co., Houston; E. C. Brown, Brown Drilling Co., Long Beach, Calif.; and William P. Clements, Jr., Southeastern Drilling Co., Dallas.

Oil-company speakers include Stanley Learned, executive vice president of Phillips Petroleum Co., Bartlesville, Okla.; J. E. Harrington, General Petroleum Corp., Los Angeles; J. W. Baldwin, Humble Oil & Refining Co., Midland, Tex.; and Frank Cooper, Sohio Petroleum Co., Oklahoma City.

Others on the program will be: Dr. A. O. Sartain, professor of psychology and personnel administration, Southern Methodist University, Dallas; R. L. Honey, safety engineer, Houston; Lt. J. Donnel and John Mallard, Chance Vought Aircraft, Inc., Dallas; Jack Rolf, Texas Mid-Continent Oil & Gas Association, and Dr. Charles Karsakoff.

J. V. Dunbar, president of Dunbar Drilling Co., Denver, and national president of A.A.O.D.C., will welcome the visitors. President at the various sessions will be R. J. Moran, Moran Drilling Co., Wichita Falls, Tex., and chairman of the association's safety committee; Don Slape, Don Slape Drilling Co., Olney, Ill.; Robert Dalgleish, Big Chief Drilling Co., Oklahoma City; H. L. Campbell, R. W. Rine Drilling Co., Wichita; and R. E. Moore, Penrod Drilling Co., Shreveport.

Rexall Drilling Co. is putting down a deep wildcat test 7 miles north of Kilgore, in Gregg County, East Texas. It is a contract job for Jack McCubbin at 2 Barton, in the Stephen Winship Survey. Hole is scheduled to go to 9,000 ft.

Mustang Drilling Co., Tyler, Tex., is contractor on a new wildcat operation 4 miles north of Malakoff, in Henderson County, East Texas. Operators are W. C. Windsor, Jr., and Hunt Graham. Listing is for 1 Williams, in the Thomas Caro Survey.

Baird & Pfeifer Drilling Co. has a rig working for Nebraska Drillers, Inc., and G. L. Wickland at a wildcat location, 1 DeFord, in 10-7n-59w, about 3 miles southeast of Buckingham field, in Weld County, northeastern Colorado. It also is scheduled for test to be drilled for Houser Drilling Co. about 1½ miles to the east in 12-7n-59w. The latter is at 1 Lauer estate.

Signal Expands Operations With Two Additional Rigs

Signal Drilling Co., Tulsa, has acquired two "slim-hole" rotary rigs from Cimarron Western Drilling Co., also of Tulsa and Denver. Signal will use the rigs in contract-drilling of stratigraphic tests in the Denver-Julesburg basin of northeastern Colorado, where they have been operated by Cimarron Western.

The purchased rigs include an Ideco H-25, and a Mayhew 3000 assembly. The former has a rated drilling capacity of 6,500 ft. with 2⅞-in. pipe and 3,500 ft. with 4¼-in. pipe. The other is rated at 6,000 ft. with the small pipe, and 3,000 ft. with the large pipe.

Addition of the two rigs gives Signal and its associated companies a total of 11 rotary rigs. These companies also operate 12 cable-tool outfits. Current operations are in Oklahoma, Kansas, Colorado, Nebraska, Wyoming, and western Canada.

Jett Drilling Co., Shreveport, will drill an 11,000-ft. wildcat test for SoRelle & SoRelle, of Houston, in the Gueydan area of northwestern Vermilion Parish, Louisiana Gulf Coast. Location, at 1 Wright, in 2-12s-1w, is about 1½ miles southeast of Gueydan field, and about the same distance northeast of the one-well Southeast Gueydan field.

Circle Drilling Co., Lake Charles, La., is drilling for Fred W. Bates, of Lafayette, La., in a new wildcat operation 4 miles northwest of Elton, in Allen Parish, South Louisiana. Contract is for an 8,500-ft. test. Location is at 1 Bel estate, in 26-6s-4w, about 3½ miles southwest of North Elton field.

Edwards & Bissett, Almeda (Houston), Tex., will drill for J. M. Flaitz and R. B. Mitchell, of Houston, at 1 Beard, a projected 9,000-ft. test on the old Long Point dome, in Fort Bend County, Texas Gulf Coast. Location,

bargain thread dope?

Is cheap thread dope really a bargain? Tool joint and drill collar thread wear can cost a lot over a year's time. Fishing jobs come plenty high. Galling or washouts mean hundreds of dollars of extra expense. 'Bestolife Lead Seal stretches thread life, cuts down on fishing jobs, galling and washouts. That's why it's the most widely used lead base thread compound in the world. Get 'Bestolife at your supply store. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

I. H. GRANCELL
1601 EAST NADEAU STREET
LOS ANGELES 1, CALIFORNIA

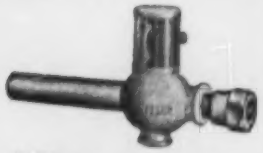
Stops Sanding

MUDWONDER®

NEW
Rockwell-Built
MUD VALVE

Edward Valves, Inc.
Subsidiary of ROCKWELL MFG. CO.
1212 W. 145th STREET
EAST CHICAGO, INDIANA

FOR ECONOMY AND HARD FIRING



INFERNO Oil Burner

Completely burns all the fuel that passes through it, affording hard firing and a substantial saving of fuel. Top performer in its field. Write for Bulletin No. 24.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.
INFERNO

An OIL BANK . . .
directed by OIL MEN . . .
in the OIL CAPITAL
of the World!

Think 1st of Tulsa
OUR 50th YEAR
FIRST NATIONAL BANK & TRUST CO.
Member Federal Deposit Ins. Corp.

at 1 Beard, in the H&TC Survey 111, is 2 miles southeast of Long Point. It is about ¾ mile from a 5,370-ft. Frio well drilled by Kennon & Cantrell.

Wise Drilling Account, Longview, Tex., has a rig working for Hoxsey Oil Co. in Navarro County, East Central Texas. It is on a projected 8,900-ft. wildcat test, 1 Sheppard, in the N. H. Carroll Survey, 3½ miles southeast of Rual Shade.

Nuckolls-Bell Drilling Co., Oklahoma City, is drilling for Clark & Cowden at 1 Garrett, a Wilcox exploratory test north of Red Hill field, in Pottawatomie County, Central Oklahoma.

San Juan Drilling Co. is drilling for **Larco Drilling Co.** at a wildcat location 1½ miles northeast of Ellisville, in Jones County, eastern Mississippi. Drilling is scheduled to go to the Rodessa (Lower Cretaceous) formation, expected around 12,500 ft. The test is carried as 1 Masonite - Anderson with location in 26-8n-12w.

Glasscock - Wilson Drilling Co., Shreveport, has contracted a 10,500-ft. wildcat test to be drilled for D. Thomason and associates, of Shreveport, in western St. Landry Parish, South Louisiana. Location is near the Evangeline Parish line, about 6 miles northwest of Ville Platte. Listing is for 1 Vidrine. Objective is the Sparta and Wilcox sections.

Buzzini Drilling Co. has moved a rig to a wildcat location 1½ miles southwest of Karnes City, in Karnes County, South Texas, where it will drill an 8,500-ft. test for Producers Corp. of Nevada. The test will be carried as 1 Stieren, with location in the Francisco Ruiz Survey.

B. F. Allison Drilling Co., Graham, Tex., and Fort Morgan, Colo., is drilling on the first of five tests it has contracted to drill in Lincoln County, East Central Colorado, for a group of six companies including Liberty Oil & Uranium Co., Stanolind Oil & Gas Co., Lion Oil Co., British - American Oil Producing Co., Pure Oil Co., and Union Oil Co.

Gregg Oil Co., Gladewater, Tex., has taken a contract for a 6,500-ft. wildcat test 3 miles southwest of Durant, in eastern Holmes County, Central Mississippi. It will be drilled for L. W. Dennis, of Tyler, Tex., acting as trustee. Location, at 1 McFarland, in 28-14n-4e, is about 12 miles northeast of Pickens field, nearest production. Objective is the Lower Cretaceous formation.

FOR CHARTER
STEEL BARGES

FOR SALE
1—173 Foot
STEEL HULL ONLY

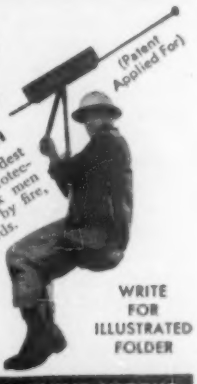
McDONOUGH
MARINE SERVICE
429 Balter Bldg.,
Magnolia 6824
New Orleans 12, Louisiana

Offshore Well Locations
and Surveys

Assured accuracy. Geodetic methods incorporate the use of modern, complete equipment—including Bilby Towers, Two-Way Radios, and Theodolites.

V. L. Beavers and Associates
International Airport
San Antonio 9, Texas
TAylor 6-6347—Collect
Branch Office—
503 Pioneer American Ins. Bldg.
Houston, Texas—ATwood 7428

For the Safety of Your Derrickmen
GERONIMO
Escape Mechanism
GERONIMO will stand hardest wear and give unfailing protection to refinery and derrick men whose lives are endangered by fire, escaping gases or other hazards.



(Patent Applied For)
Sold Through Your Supply Store
WRITE FOR ILLUSTRATED FOLDER
The CHARLES MACHINE WORKS
PERRY, OKLAHOMA

The UNDERWRITER . . . . .

. . . a specialist in

WORKMEN'S COMPENSATION INSURANCE

The TEIA Underwriter is a specialist in Workmen's Compensation Insurance, with a thorough understanding of the employer's problems and the special provisions of the Texas Workmen's Compensation Law.

Let the TEIA Underwriter and the SERVICE TEAM, of which he is a part, work with you . . . to improve your Workmen's Compensation Insurance coverage and service . . . and SAVE you money.

Millions of Dollars saved policyholders by Texas largest writer of Workmen's Compensation.

HOMER R. MITCHELL, *Chairman of the Board* A. F. ALLEN, *President*

Service Offices: ABILENE • AMARILLO • AUSTIN • BEAUMONT • CORPUS CHRISTI • DALLAS • EL PASO FORT WORTH • FREEPORT • GALVESTON • HARLINGEN • HOUSTON • LUBBOCK • MIDLAND ODESSA • PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

TEXAS EMPLOYERS INSURANCE ASSOCIATION
HOME OFFICE - DALLAS, TEXAS

5 GOOD REASONS

WHY GOODALL LONG-LIFE ROTARY HOSE IS YOUR BEST BUY!

STRENGTH
FLEXIBILITY
LONG LIFE
ECONOMY
REPAIR SERVICE

This combination of important features is the reason why more and more Goodall Long-Life Rotary Hose with the Barney Coupling is being specified every day. Maximum initial life is assured by the Goodall design which has proved the strongest, most flexible rotary hose ever built. And with Long-Life Rotary Hose, your investment is protected by Goodall's exclusive **maintenance**. If your Long-Life hose should meet with an accident, the Barney Coupling can be reset to make your hose as good as new for the rest of its normal life. Add to these sound features the fact that this extra value cost no more than ordinary rotary hose and you can readily see why Goodall Long-Life Rotary Hose is your best buy. Available through all supply stores.

GOODALL RUBBER COMPANY

TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Odessa, San Angelo, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
STOCKING DISTRIBUTORS: Texas and Louisiana — Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Company, Harries Sales & Rental Co. Oklahoma — Iverson Supply Co. Kansas — Mountain Iron & Supply Co.

Save Time

. . . Use These Handy Time-Saver Cards

Want more information on products advertised in this issue? Or do you want to know more about the items described in the "New Equipment Section"? Or would you like some of the literature here mentioned?

Let us get it for you

Just use the convenient prestamped cards on this page. We'll forward your requests promptly.

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of May 2, 1955

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)
(21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40)

I WOULD LIKE TO RECEIVE FURTHER DETAILS ON PRODUCTS ADVERTISED ON

Page____ By____ Page____ By____
Page____ By____ Page____ By____
Page____ By____ Page____ By____

PLEASE PRINT
COMPANY NAME____
STREET ADDRESS____
CITY____ ZONE NO.____ STATE____
NAME____ TITLE____
This card void after 90 days.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 2, Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

2

Check here FOR NEW EQUIPMENT OR LITERATURE

Mark here FOR MORE INFORMATION ON ADVERTISED PRODUCTS

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of May 2, 1955

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)
(21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40)

I WOULD LIKE TO RECEIVE FURTHER DETAILS ON PRODUCTS ADVERTISED ON

Page____ By____ Page____ By____
Page____ By____ Page____ By____
Page____ By____ Page____ By____

PLEASE PRINT
COMPANY NAME____
STREET ADDRESS____
CITY____ ZONE NO.____ STATE____
NAME____ TITLE____
This card void after 90 days.

Save Time

. . . Use These Handy Time-Saver Cards

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 3, Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

3

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of May 2, 1955

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

I WOULD LIKE TO RECEIVE FURTHER DETAILS ON PRODUCTS ADVERTISED ON

Page____ By____ Page____ By____
Page____ By____ Page____ By____
Page____ By____ Page____ By____

PLEASE PRINT
COMPANY NAME____
STREET ADDRESS____
CITY____ ZONE NO.____ STATE____
NAME____ TITLE____
This card void after 90 days.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 3, Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

The cards shown here are supplied for your convenience. Just ✓ ✓ ✓ check the circle with the number of the item in which you are interested, tear off the card, and drop it in the mail.

We do the rest

If you want additional information on any product advertised in this issue, note the page number on the card.

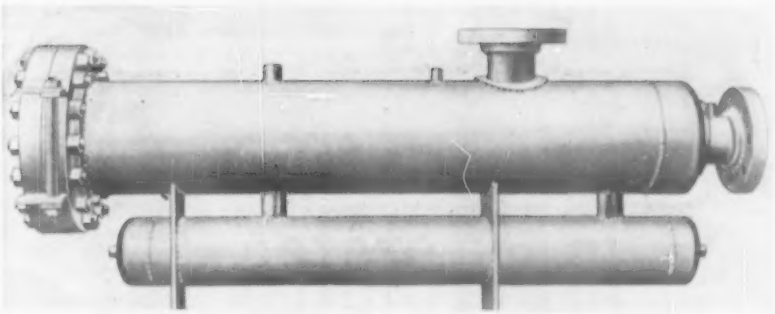
We'll get it for you

(No postage required)

. . . What's New in Equipment?

Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller



Gas Scrubber Removes Small Particles

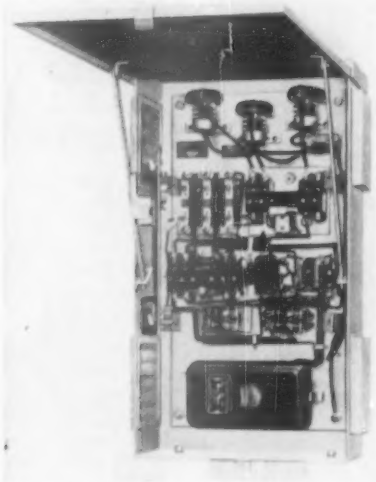
A new natural-gas scrubber and filter is designed to remove micron-size particles from gas streams under pressure.

This unit can replace oil-type wet-gas scrubbers on natural-gas distribution systems. The filter uses replaceable fiber-glass elements. It can be operated for long periods without maintenance or attention.

The unit will remove fine mist particles by coalescing them into larger particles. These in turn are removed by a conventional mist eliminator furnished as part of the filter. *Perry Equipment Corp.*

Check No. 1 On The Time-Saver Card

●



Pumping Control Provides For Changes in the Field

An improved oil-well pumping control provides for changing restarting characteristics in the field. Some operations require automatic restarting of a pump motor after a power failure, while others require undervoltage protection. Other operations require staggered restarting of a number of motors automatically.

The new controller permits in-the-field incorporation of these features. The control panel is provided with mountings and interchangeable wiring connections to permit easy later mounting or exchange of either an undervoltage relay or an automatic time-delay without removing the panel from its enclosure.

A wiring diagram sealed in a protective cover shows the circuit arrangements. It has numbered leads for operation with the undervoltage relay, with the time-delay relay, or without either relay.

The controller combines the standard across-the-line starter with a fusible disconnect switch, program time-switch, and safety devices in a single N.E.M.A.-3, weather-resisting enclosure. It is provided with a synchronous motor-driven program timer, individually enclosed in a semidusttight case. The program timer is easily set without the use of tools. The timer can be provided with a day-omission feature, permitting pumping operations to be discontinued for any day or days of the week without requiring additional attendance. *Cutler-Hammer, Inc.*

Check No. 2 On The Time-Saver Card

●

Drinking Water Purifier Supplies 48 Gal. Per Hour

This water purifier was developed for foreign field crews. In isolated locations, particularly abroad, pure drinking water is always a problem and in some cases it is necessary to have purified water shipped by bottles to the crews. With this equipment crews can now convert river, pond, or salt water into drinkable water at the rate of 48 gal. per hour.

The box on the rear end houses the evaporating coils which are heated by the diesel motor shown in the middle of the trailer. The motor in turn is fed from the fuel tank. After passing through the evaporating coils, the water passes through another set of coils, then to a collecting tank. Feed water is obtained through a hose at the back of the trailer. Automatic level controls keep the right amount of water running through the purifier to maintain the 48-gal. per hour production. *Rogers Geophysical Co.*

Check No. 3 On The Time-Saver Card

serving you with 22 stores and 11 regional offices in 5 states

You can rely on ★ *United Supply*

UNITED SUPPLY

TULSA, OKLA.
phone 4-5154
OKLAHOMA CITY, OKLA.
PHONE JA 4-8415
ARDMORE, OKLA.
phones 1441 - 4891
PAULS VALLEY, OKLA.
phone 1080
SEMINOLE, OKLA.
phone 1665
VELMA, OKLA.
phone 36
ELK CITY, OKLA.
phone 896
GREAT BEND, KAN.
phones 3506 - 7579
CANEY, KAN.
phone 629
EUNICE, LA.
phone 2651
NEW IBERIA, LA.
phones 2-5351 - 2-5852
HOMER, LA.
phone 2134
SHREVEPORT, LA.
phone 7-3622
DALLAS, TEX.
phone RA-4237
MIDLAND, TEX.
phones 4-5441 - 4-6702
HOUSTON, TEX.
phones Preston 7288
CH-5369
DENVER CITY, TEX.
phone 99
ODESSA, TEX.
phone 7-1161
ALICE, TEX.
phone 4-6557
EDNA, TEX.
phone 4851
KERMIT, TEX.
phone 2567
ANDREWS, TEX.
phone 560
SNYDER, TEX.
phone 3-5476
SUNDOWN, TEX.
phone 3991
EUNICE, N. M.
phone 2621
LOVINGTON, N. M.
phones 5301 - 8241
HOBBS, N. M.
phone 3-2217
NEW ORLEANS, LA.
phone Magnolia 3781

UNITED SUPPLY
AND *Manufacturing* COMPANY
TULSA, OKLAHOMA

COURTESY ● SERVICE ● DEPENDABILITY

What's New... Use the handy Time-Saver Cards

Dry Feeder Is Best Suited For Oil Industry Uses

The Prater feeder, with rotary airlock design, is particularly suited for the petroleum industry. For consideration in handling catalysts, carbon black, and other materials, it's designed for high or low-pressure systems in the process industries.

It seals off air at the bottom discharge of spray dryers, dust collectors, and bag filters. It will feed any kind of powdered or granular product into pneumatic conveying lines in various types of processing. And it will function as a working seal to sustain differential pressures.

With variable speed transmission, the Prater feeder can feed continuously at a predetermined rate or can be instantly increased or decreased. *Prater Pulverizer Co.*

Check No. 4 On The Time-Saver Card

●

Pull-Back Repositions Tong for Take-Up

Tugger, a rugged rubber tong pull-back for use with rotary drill pipe and casing tongs, automatically repositions the tong for another take-up, thus saving valuable time and labor for working crews.

The tong pull-back acts as a rubber spring and only has to be stretched slightly for proper operation. The special rubber used has very high elasticity and strength. According to tests, the Tugger has an elasticity rating three times its normal length and a 1,450-lb. strength test. Weight is 2½ lb.

The tong pull-back is easily installed on the line between the tong arm and derrick leg or back-up post. *Byron Jackson Co.*

Check No. 5 On The Time-Saver Card

TC-12 Crawler Makes New Size Class

The TC-12 Twin-Power Crawler Tractor, with 40 per cent greater weight, and 80 per cent more horsepower, establishes a new size class of crawler tractors. Greater workability of the tractor will be evident in bulldozing, pioneering, and towing applications.

The TC-12 incorporates two 194-hp. series 6-71 General Motors diesels, each driving one of the tracks through separate Allison Torqmatic drives consisting of torque converter and semiautomatic transmission. There is no master clutch. Changing from one speed range to another is done under full power. Three speed ranges in forward and reverse provide speeds to 1.5 m.p.h. in low range, 3.0 m.p.h. in intermediate, and 8.3 m.p.h. in high.

This arrangement of the power train provides simple operation, steady flow of power, and greater drawbar pull at faster speed. With a separate power train for each track, steering is fast and easy. Steering is accomplished by putting either transmission in neutral and using the corresponding steering brake. Tight turns are made by reversing one transmission and keeping the other in forward speed.

Maintaining proper track tension is automatic on the TC-12. A hydraulic jack maintains uniform pressure on the front idler, and an accumulator absorbs recoil if a large stone or other object should get between the track and sprocket.

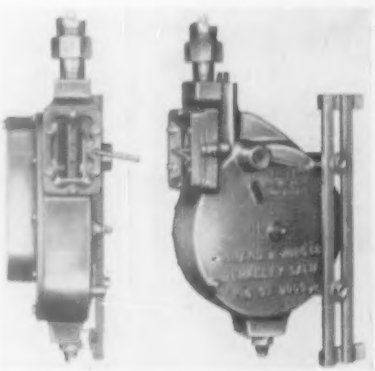
The Twin-Power design results in each half of the tractor being a separate unit joined to the other by a single big transverse shaft. Each half is thus free to move 7 in. up or down to manitain better contact and traction on rough ground. For shipping purposes, the tractor can be separated into two halves.

Another design feature is the rear location of the two radiators, each having a 28-gal. capacity. There is no obstruction of air flow regardless of attachments—efficient engine operating temperatures can be maintained.

Track gage is 110 in., over-all width is 136 in., and over-all length is 194 in. Drawbar height is 23 in. and ground clearance is 20 in. Operating weight of the bare tractor is 58,000 lb. Drawbar pull of the tractor, with normal bulldozer attachments, is 69,750 lb., dependent on total tractor and equipment weight. *Euclid Division, General Motors Corp.*

Check No. 6 On The Time-Saver Card

●



Automatic Tank Gage Gives Increased Accuracy

A new, fully automatic tank gage provides increased gaging accuracy. Designated as Fig. ST-8000, this gage incorporates a Neg'ator motor replacing the counterweight and cable assembly.

Use of the Neg'ator motor reduces friction, compensates for tape payout and reeling in, maintains constant tape tension, and is suited for greater ac-

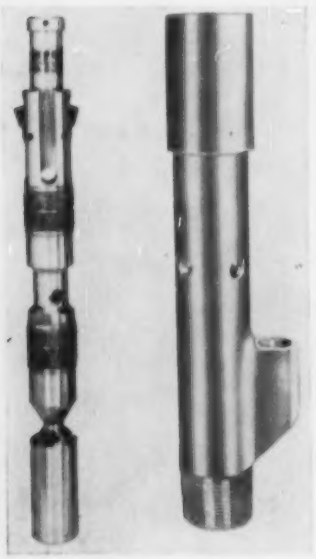
curacy throughout long float travel in tanks up to 65 ft. high. The Neg'ator motor has a minimum fatigue life of 13,000 cycles, equivalent to full float travel up and down twice a day for nearly 20 years.

The ST-8000 gage also includes a new stainless-steel tape with high-visibility graduated markings in feet, inches, and eighths of an inch. The gage head has a large mounting bracket which accommodates a full-length slip joint. This permits installation that puts the reading window at eye level. It also facilitates installation so that tape adjustment can be made at the mounting bracket and slip joint, with final adjustment made with the reading-index pointer.

The gage is applicable to all low-level petroleum-storage tanks. Floats, tapes, and guide-wire assemblies are common to all earlier S&J automatic gages, and the ST-8000 gage head is interchangeable on existing installations. *Shand & Jurs Co.*

Check No. 7 On The Time-Saver Card

●



Dual-Completion Nipple Accepts Parallel Strings

The Model H parallel-string completion nipple is installed in the tubing string immediately above a single-packer installation. Designed to accept the threads of both strings of a parallel-stringed installation, it provides more efficient flow passages for dually completed wells. Each zone is produced separately through separate strings of tubing. The nipple also permits artificial lifting of the upper zone without producing the gas through the pump, since the gas is conducted up the annulus. When installed in a singly completed well, one string may be used to inject chemical with mud in place in the annulus.

The Model H separation sleeve with its self-cleaning locking device may be run and pulled through an A.P.I. pump-seating nipple with wire-line tools. When landed in the completion nipple, it seals off the interconnecting flow passages and separates the producing horizons.

By interchanging retrievable mandrels, both strings may be plugged for running pipe into the well. Either zone may be treated, tested, or swabbed through one string. The two strings may be circulated, or the producing zones crossed over. *Pressure Services, Inc.*

Check No. 8 On The Time-Saver Card

●

Delta Announces New Spherical Separators

A new line of spherical separators can process up to 16,000 bbl. of crude oil daily. These spherical separators range from 41 to 60 in. in diameter and have gas capacities ranging from 6.5 to 57 M.M.c.f. Standard units are available in 125 psi., 500 psi., and 1,200 psi.

The 41-in. unit stands less than 5 ft. high when installed and is comparable to standard vertical-type separators rising 10 to 12 ft. above the ground.

The new-type Delta spherical separators operate on a combined gravity, centrifugal force, time-retention, low-velocity principle, with the crude oil falling to the lower section of the vessels and the gases rising to outlets at the top of the steel balls. The internal-baffle arrangement and mist-extractor design of these units assures complete separation within the rated capacities.

The 41-in. spherical unit, made for 125 psi., can separate 3,500 bbl. of crude oil and 6.5 M.M.c.f.d. of gas. Comparable in performance to vertical separators standing up to 12 ft. above the ground level, the 41-in. unit weighs only 670 lb.

Other sizes and capacities of the new Delta separator line are:

1. 46-in. diameter; 125 psi.; stands slightly over 5 ft. installed; capacity of 9,000 bbl. of crude and 8.5 M.M. c.f.d. of gas; weight 890 lb.

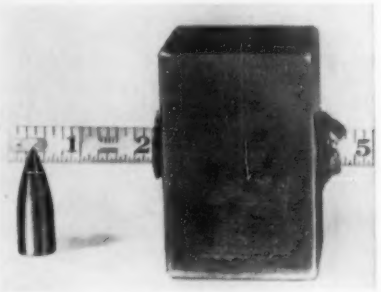
2. 60-in. diameter; 125 psi.; slightly over 6 ft. tall; capacity of 16,000 bbl. of crude oil and 18 M.M.c.f.d. of gas; weight 2,500 lb.

Delta units designed with 500 psi. are available in 42, 48, and 60-in. diameters. The 42-in. separator can process 2,500 bbl. of crude oil and 14 M.M.c.f.d. of gas. The 48-in. unit has a daily capacity of 18 M.M.c.f.d. of gas and 4,000 bbl. of crude, while the 60-in. unit can handle up to 7,000 bbl. of crude daily and 36 M.M.c.f.d. of gas.

The 42, 48, and 60-in. diameter units are also produced with 1,200 psi. The 42-in. 1,200 psi. unit has a daily capacity of 3,000 bbl. of crude and 21 M.M.c.f.d of gas. The 48-in. unit can process 4,000 bbl. of crude and 28 M.M.c.f.d. of gas, while the 60-in. unit has a daily capacity of 8,000 bbl. of crude and 58 M.M.c.f.d of gas. *Delta Tank Manufacturing Co.*

Check No. 9 On The Time-Saver Card

●



Bullet and Gun Design Improve Penetration

A new, deeper-penetrating ogival bullet; a redesigned, more effective pressure seal; and further refinements in the firing chamber design of the M-3 bullet perforators have been developed.

The improved M-3 guns firing new ogival bullets have shown an increase in penetrating ability of 50 to 75 per cent over results previously obtained. The photo shows the results of a test where a new ½-in. ogival bullet fired from an improved M-3 gun completely pierced a full 1½ in. of mild steel.

The newly designed ogival bullet is claimed to be the deepest-penetrating bullet known. Type and quality of steel, heat treatment, weight, and shape are all carefully controlled production factors. Driven at tremendous velocity, the new bullet penetrates one, two, or even three strings of casing, through cement sheaths, and deeper into the formation than was previously possible. *McCullough Tool Co.*

Check No. 10 On The Time-Saver Card

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Sili-Kool. This six-page, illustrated brochure describes a heat, rust, and corrosion-resistant silicone paint that withstands 1,600° and exposure to extreme weather conditions. It shows an unretouched picture of one hot-air pipe painted with Sili-Kool that has carried air heated up to 1,600° F. for 14 months without the slightest ill effect upon the surface. *C. H. Dragert Co., Inc.*

Check No. 11 On The Time-Saver Card

●

Hydraulic Drives for Aerial Cooler Fans. In addition to an analysis of the principal advantages of the use of hydraulics for this type of application, this eight-page bulletin includes circuit diagrams, mounting dimensions, drawings, and a cutaway view illustrating design and construction details. A special feature of bulletin FD-1 is the drive selector designed to simplify the specification of drives for various fan requirements. *Berry Division, Oliver Iron & Steel Corp.*

Check No. 12 On The Time-Saver Card

●

Electric Pilot Service, a four-page brochure, points out 10 important oil-well services that are offered from one truck. Included in these services are: spinner surveys; permeability surveys; selective acidizing; radioactive selective acidizing; channel-determination surveys; perfojet service; gamma-ray logging service; water-location surveys; caliper surveys; and temperature surveys. *Dowell Incorporated.*

Check No. 13 On The Time-Saver Card

●

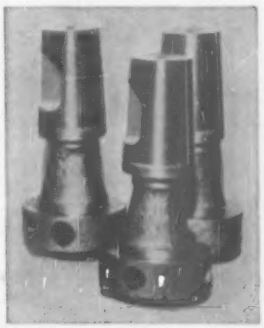
Stainless-Steel Floor Grating. This file-worthy data folder offers a standard table of safe loads and general engineering data. Diagrams of standard and close-spaced grating are shown and properties of stainless steels are tabulated. *Kerrigan Iron Works, Inc.*

Check No. 14 On The Time-Saver Card

■

For Your Safety—Ampco Spark-Resistant Tools. Most every type of hand tool

Colmonoy Spraywelding Hard-Faces Valve Plugs



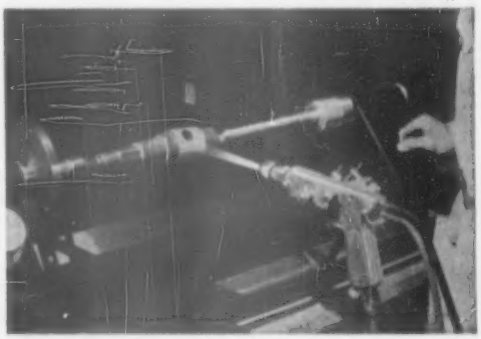
Homer valve plugs shown after finish grinding of the Colmonoy overlay.

Longer valve plug life is a goal sought by everyone concerned with valves in the process industries. Hamer Valves, Inc. (California), makers of valves for the petroleum and chemical industries, reports new success in this field.

They're hard-facing valve plugs with Colmonoy No. 4 alloy, applied with the Colmonoy Spray-welder. These Spraywelded plugs last 3 to 4 times longer than hard-chrome plated plugs.

The cement-slurry valve plugs (above) are shown after the Colmonoy overlay was sprayed and fused. The close tolerance spraying will require little grinding to bring plugs to size.

The Colmonoy Spraywelder is a metal spraying unit for applying powdered Colmonoy alloys. These alloys impart superior abrasion and corrosion resistance to finished metal parts. After spraying, the overlay is fused to the part with an oxy-acetylene torch. The Homer set-up above shows a plug being sprayed while rotating in a lathe.



Write for the new Model C Spraywelder Catalog today.

HARD-FACING ALLOYS

19345 JOHN R STREET **WALL COLMONOY** DETROIT 3, MICHIGAN

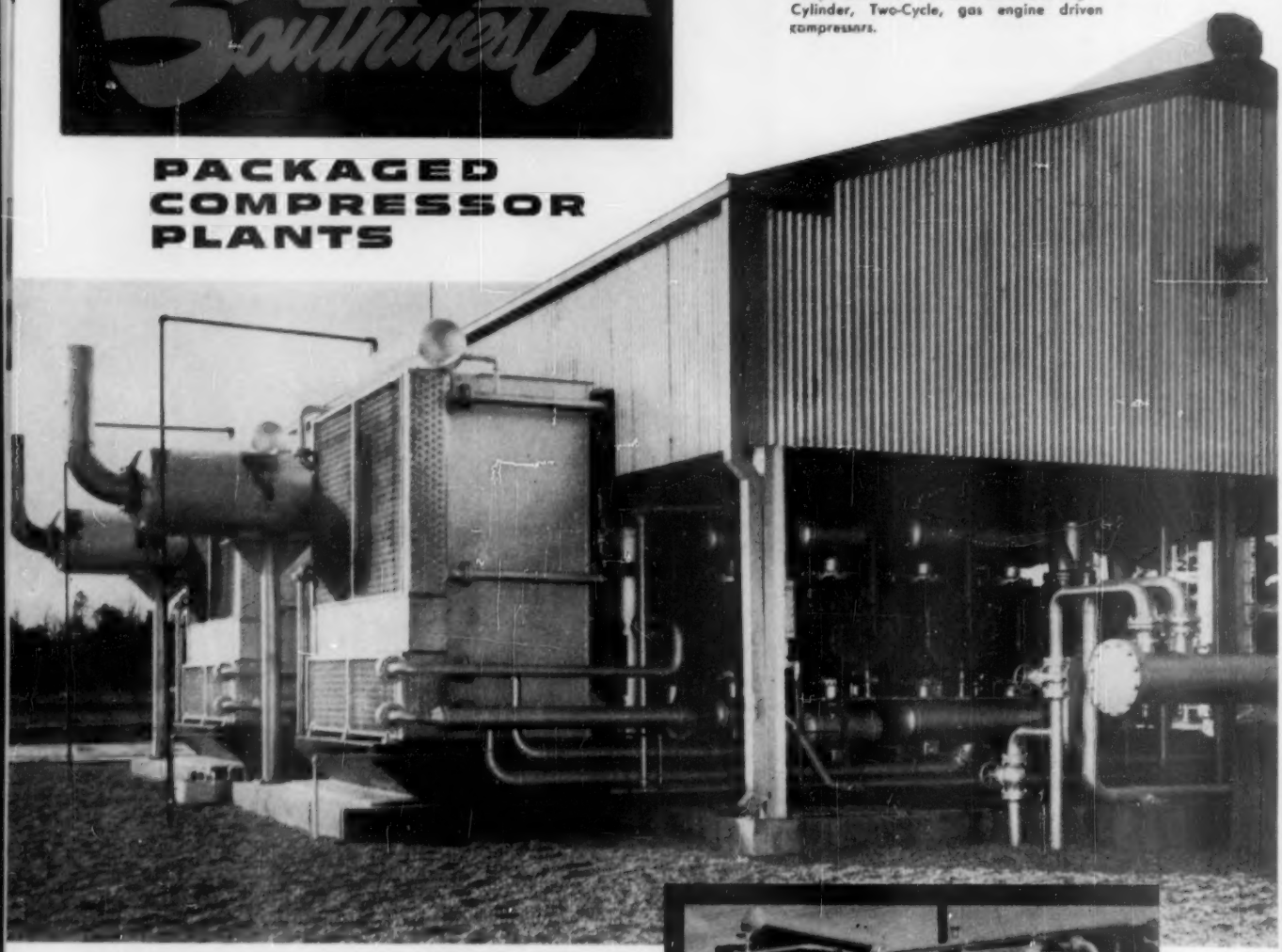
CORPORATION

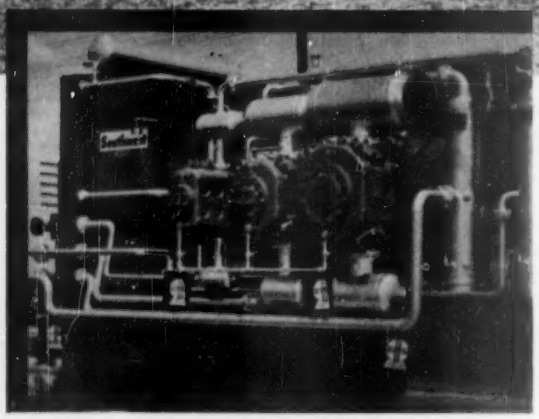
BIRMINGHAM · BUFFALO · CHICAGO · HOUSTON · LOS ANGELES
LINDEN · MORRISVILLE · PITTSBURGH · MONTREAL · GREAT BRITAIN

Southwest

PACKAGED COMPRESSOR PLANTS

M. L. Mayfield Company's Packaged Compressor Plant, Pine Prairie Field, Easton, Louisiana. Equipped with two Southwest—Cooper-Bessemer 440 H.P. GMX 8-TF Eight-Cylinder, Two-Cycle, gas engine driven compressors.





FLARE GAS FOR GAS LIFT

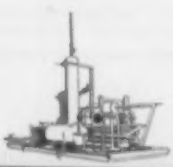
Gas pressure from wells was too erratic and too low for gas lift. But, after the installation of two 440 H.P. Southwest Packaged Compressor plants, this field gas was put to work at gas lift, and there was a surplus to sell.

These Southwest units have three stages of compression, raising the field gas from 30 to 750 psig for gas lift or to 1,000 psig to feed into a sales line.

Instead of one large unit, these two were installed to assure continuous field operation. Each unit is equipped with variable unloading equipment. Any condition that will be encountered in their operation, from one unit handling gas lift to both units operating for gas lift and sales gas, can be handled easily.

Automatic controls allow the units to run unattended except for routine servicing as a part time job of one man.

Southwest Packaged Compressor plants have lower installation cost than a conventional plant plus almost complete salvagibility if the plant should be relocated.



SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773, Houston 7, Texas

made of Ampco metal for jobs that require torque; of Ampco beryllium-copper for tools that have cutting edges and gripping teeth; and of Ampco monel for use around chemicals that attack copper-base alloys, is listed in this 20-page 2-color catalog. *Ampco Metal, Inc.*

Check No. 15 On The Time-Saver Card

●

Salzgitter Cantilever Drilling Masts. The light steel construction, section rigidity, portability, substructure, racking platform, crown block, and accessories are graphically illustrated in an eight-page brochure. Ample engineering information is tabulated in data tables. *Haniel & Lueg G.m.b.H.*

Check No. 16 On The Time-Saver Card

●

Success Is Not An Accident. A 36-page, spiral-bound book illustrates the skill and facilities behind 160-year-old designer and manufacturer of heavy industrial equipment. Among the products illustrated are welded storage tanks, a regenerator unit for a cracking plant, gas holders, extraction plants, pressure vessels, and fractionating columns. *Newton Chambers & Co., Ltd.*

Check No. 17 On The Time-Saver Card

●

Services for the Oil Industry. Ways to increase production are suggested in this catalog on fracturing, acidizing, cementing, wire line, perforating, chemical cleaning, and miscellaneous services. Its 24 pages are profusely illustrated in two colors and present all of the services and products offered. Photographs, drawings, and diagrams are used throughout to illustrate equipment, treating tools, and techniques used to perform services for the oil industry. *Dowell Incorporated.*

Check No. 18 On The Time-Saver Card

●

Sealtight Pipeshield, a new brochure, covers a sturdy, flexible, asphalt mastic board manufactured in job-specified sizes. Sealtight pipe shield is scored every inch and is easily formed and strapped to pipe. It provides a positive protection against rock damage, and eliminates the expense of dirt padding. *W. R. Meadows, Inc.*

Check No. 19 On The Time-Saver Card

●

U. S. Type H. Uniclosed Motor. A multicolor 12-page booklet illustrates the numerous features of the all-new U. S. Type-H Uniclosed motor. Cut-

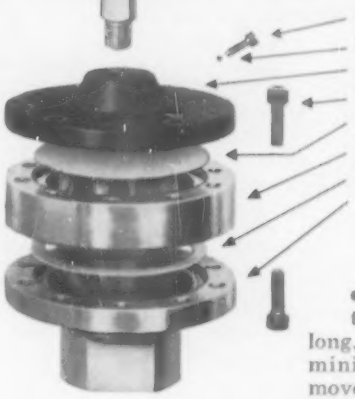
an ACCO product

Helicoid Chemical Gage

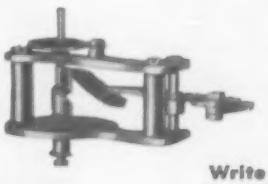
Gages for corrosive chemicals and liquids up to 5000 p.s.i.

● Here's an accurate pressure gage for chemicals and other viscous liquids which might corrode or clog the Bourdon Tube. It registers working pressures from 30" vacuum to 5000 p.s.i. and temperatures to 400° F. Guaranteed accuracy plus or minus 1%. A single diaphragm seals off objectionable substances from the indicating gage. This gage is filled completely with specific inert liquids and pressure is transmitted directly to the indicating gage through deflection of the sealing diaphragm.

FEATURES



● HELICOID GAGES cost less in the long run because they give long, trouble-free service with a minimum of maintenance. The movement is a simple cam and roller design that does not have any gear teeth to wear out. It has been tested and proved in years of hard service.



Only Helicoid Pressure Gages Have the Helicoid Movement

Write for Catalog Today

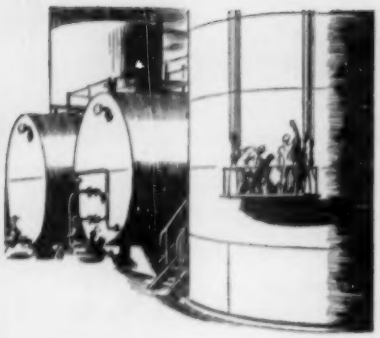
ACCO

Helicoid Gage Division

AMERICAN CHAIN & CABLE

929-A Connecticut Avenue • Bridgeport 2, Connecticut

Pressure • Vacuum • Compound



Paints made specially for the oil industry *cut costs*

The oil industry use International paint specialities because they have proved to give better performance...because storage tanks, pipelines and structural steelwork can be coated with International not only quickly and effectively, but to give really lasting results.

Save on painting costs — *save* by having longer lasting protection and *save* by using paint that semi-skilled labor can apply.

★ *If you haven't details of International's oil industry specialities please let us know.*

International Paints

A world-wide paint organisation with 23 factories throughout the world.

NEW YORK:
INTERNATIONAL PAINT CO., INC.
21 WEST STREET, NEW YORK 6, N.Y.
MONTREAL:
INTERNATIONAL PAINTS (CANADA) LTD.
6700 PARK AVENUE, MONTREAL

LONDON: INTERNATIONAL PAINTS (EXPORTS) LTD.,
GROSVENOR GARDENS HOUSE, LONDON

away views of the improved motor, illustrating its various construction features, are shown in full color. By increasing precision of manufacturing processes, with tolerances to closer limits and improved electrical characteristics, the new Type-H is more compact than previous models. An outstanding feature is its new fully protected design. *U. S. Electrical Motors, Inc.*

Check No. 20 On The Time-Saver Card

●

V-Drive Engineering Catalog. V-Drive selections, using new horsepower rating and improved rating techniques as adopted by Multi-V-Belt Drive and Rubber Manufacturers Associations, can now be made quickly and accurately with Guide No. 50-B. Simplified formulas for standard quarter-turn and V-flat drives are augmented by tables of drives in all belt sections which have been compiled for quick selection of drives of required ratio and speed. This bulletin also contains engineering information on other types of V-belt drives. *Fort Worth Steel & Machinery Co.*

Check No. 21 On The Time-Saver Card

●

Tubing For Elevated Temperature and/or Pressure Service. Information of interest and value to engineers and designers associated with the use of tubing for elevated temperatures and/or pressure service is included in data folder TDC-177. The folder shows the chemical analyses of the standard carbon, alloy, and stainless tubing steels used in such service. It is cross-indexed to associate grade and A.S.T.M. specifications for the individual tubing steels involved. For ready reference, the bulletin also lists the A.S.T.M. tubing and pipe specifications by number and title. *The Tubular Products Division, The Babcock & Wilcox Co.*

Check No. 22 On The Time-Saver Card

●

Type S and SS Heavy-Duty Diesel Engines, a new 20-page bulletin, describes features of heavy-duty diesel engines in sizes from 375 to 1,000 hp. This bulletin, Form 10,040, provides complete information about the lubrication, cooling, and fuel-injection systems of the engines. It furnishes details about engine-housing design, full-floating aluminum bearings, large-diameter crankshaft, gear-driven auxiliares, and other features. Included also are specification and dimensional sections and a number of illustrations of the engines and component parts. *Ingersoll-Rand.*

Check No. 23 On The Time-Saver Card

Designers

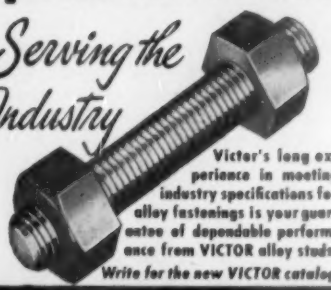
- PIPING
- STRUCTURAL

To design new oil-refineries and chemical plants. Please send your resume to our Personnel Department. Your letter will receive immediate and confidential attention.

C F BRAUN & CO
Engineers
Constructors
ALHAMBRA, CALIFORNIA

VICTOR *ALLOY STUDS*

Serving the Industry



Victor's long experience in meeting industry specifications for alloy fastenings is your guarantee of dependable performance from VICTOR alloy studs.
Write for the new VICTOR catalog.

VICTOR PRODUCTS CORP.
2675 W. BELMONT AVE. • CHICAGO

UP-TO-DATE PIPE LINE MAPS

"JACOBSON'S MAP SHOWING CRUDE OIL AND GASOLINE PIPE LINES OF THE UNITED STATES AND CANADA"

SHOWS: Crude oil pipe lines in blue—gasoline pipe lines in red—key refineries with capacity barrels crude oil per day—principal cities and towns.

Pipe lines are indicated with dashes, dots and straight lines so that it is possible to trace individual pipe line systems. Pipe sizes are shown on pipe lines in Rocky Mountain area.

Size 54" x 76". Scale 1"=40 miles.

"JACOBSON'S MAP SHOWING NATURAL GAS PIPE LINES OF THE UNITED STATES AND CANADA"

SHOWS: Natural gas pipe lines are indicated with dashes, dots and straight lines so that it is possible to trace individual pipe line systems—major gas fields are shown in solid red and general gas areas are outlined in red—principal cities and towns.

Size 54" x 76". Scale 1"=40 miles.

Prices sent on request

E. C. JACOBSON, MAPS
315 Mayo Bldg. Tulsa, Okla. Phone 2-1952

7 Reasons Why

. . . PARKERSBURG Single Tube Horizontal Separator is Superior to two tube designs.

20% slower gas flow than in two tube designs assures more effective natural separation.

20% greater interface area provides more thorough and complete de-gassing.

Longer retention time allows more time for oil to give up its gas.

Freezing problem minimized because warm gas stream is in contact with liquid.

Easier to clean because there is just one tube to clean, unobstructed along bottom, with three drains instead of one.

Hairline accuracy of liquid level maintained by exclusive No-Bleed Liquid Level Controller.

Easier unitization — basic Parkersburg one tube can be economically and effectively adapted for two stage and three-phase separation.

● Why not put these 7 benefits of the Parkersburg Single Tube Horizontal Separator to work for you.

PESA

Parkersburg

RIG AND REEL COMPANY

DIVISION OF PARKERSBURG : AETNA CORPORATION

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

5515

We're talking to you! . . .

Sorry we had to shout, but here are some facts you ought to know.

The correct operation of any type of lease tank can be assured by the insistence of the buyer that the tanks be equipped with hatch valves that are known to give long and trouble-free service. The difference in cost is negligible when you consider the loss of vapors and volume caused by an inoperative hatch valve.

We at Enardo stand behind all our products. We keep several men continually on research and development of new and better ways to make our products give more efficient service.

We are proud to say that many of our products are still giving good service in the field after twenty years on the job.

If we offended you by shouting, we're sorry. But if you're looking for the best — insist on the Enardo label.

ENARDO manufacturing company

BOX 1647 • TULSA, OKLAHOMA

EQUIPMENT MEN . . . in the News

Harnischfeger Names Oil Field Sales Manager

Harnischfeger Corp. has appointed Walter K. Graham manager of its oil-field sales. Graham has worked for National Tube Co., a division of U.S. Steel Corp. While there he specialized in sales and engineering of tubular goods for oil wells, pipelines, and refineries. In 1946 Graham joined A. O. Smith Corp. and was appointed district sales manager at Atlanta, Ga.

At Harnischfeger, Graham will manage oil-field sales promotion of all P&H products and will devote most of his time to power cranes and shovels and products of the welder and diesel divisions.

Parkersburg Shifts Allen

George C. Allen has been transferred from Parkersburg Rig & Reel Co.'s Houma, La., branch to Maracaibo, Venezuela, where he will serve as sales representative in Western Venezuela, Colombia, and Peru.

Mission Holds Regional Sales Meetings

Mission Manufacturing Co., Houston, recently held a series of regional sales meetings to discuss sales plans and new-product development with sales representatives. Pictured at the Houston meeting, top, are, front row: R. E. White, general manager of Mission; W. B. Sharp, chairman of the board; Ed Prather, secretary; Dudley Sharp, president; W. T. Campbell, executive vice president; and C. R. Summers, South American representative. In the back row are: Ben Young, chief engineer; Tony Volotko; Cobb Turner; A. E. Higginbotham; Shad Mims; T. R. Fullinwider, domestic sales manager; Joe Scalise; Jack Stewart; Buddy Hebert; Jack Bannister; Bill Underwood; and Sonny Wyatt. At the Odessa meeting, center, were, front row: Dean Hollum, O. K. Ryan, W. T. Campbell, and Lonnie Roberson. In the back row are: Ben Young, Pat Welch, R. E. White, Jack Hardy, T. R. Fullinwider, Bud Roberson, and John Bannister. Pictured at the Oklahoma City meeting, bottom, are, front row: Ben Young, George De Arman, Jack Brown, and John Brown. In the back row are: M. C. Davis, W. T. Campbell, Bud Boyd, R. E. White, Bob Woods, Charlie Fryar, and T. R. Fullinwider. Joe Young, who also attended the meeting, was not present for the picture.

BS&B Announces Four Key Appointments in Sales

Black, Sivalls & Bryson, Inc., has announced the appointment of four men to key positions in the oil-field sales organization, according to Floyd C. Myers, manager of the oil-field sales and service division.

To effect closer supervision of district sales territories, field supervision

LEE KELTON

RALPH STEVENS

is being divided between two oil field sales managers, Myers stated.

Lee Kelton has been appointed manager of Mid-Continent oil-field sales and Ralph Stevens manager of Gulf Coast oil-field sales. Both men will headquarter at Oklahoma City.

To further affect closer supervision, Myers announced that the Houston district has been divided into two separate districts, one with headquarters at Houston and the other with headquarters at Alice, Tex.

Benjamin (Bill) Bourne has been appointed oil-field district sales manager for the Houston district, and John Cross has been appointed oil-field district sales manager for the newly created Alice district.

Kelton has served BS&B in a wide-range of capacities during his 20 years

B. BOURNE

JOHN CROSS

of service. Starting as a branch clerk in Houston in 1935, he became a salesman in West Texas, branch manager at Lafayette, La., and later at Casper, Wyo. In 1947, he was promoted to sales manager for the Rocky Mountain district and in 1954 became manager of Oil-field division sales.

Stevens, who has been with BS&B

for 35 years, has spent most of that time in the Gulf Coast area. For the last 20 years, he has been regional and then district manager with headquarters at Houston.

Joining the BS&B organization in 1946 as sales engineer at Odessa, Tex., Bourne was transferred to Tulsa as city sales engineer in 1951, where he has been located until his new assignment.

Cross went to work for BS&B in 1944 as branch clerk at Odessa, Tex. He soon became a salesman out of that branch, and in 1950 was promoted to branch manager at Hobbs, N. M. Late in 1951, he was appointed senior salesman at Hobbs in order to devote full time to selling activities.

Baroid Opens Mud Store At Long Beach, Calif.

A new store devoted entirely to the sale of mud has been opened at Long Beach as the Baroid division of National Lead Co. opened its first direct sales store to serve oil industry. The firm supplies clays, chemicals, and other materials used in special muds needed for oil-well drilling.

The new store is designed to give comprehensive direct-from-manufacturer service, according to E. H. Mohr, Jr., manager of the Pacific Coast division of Baroid.

The store will stock a full line of all Baroid mud products and mud-testing equipment. Store manager Hubert

E. H. MOHR, JR.

H. SANCHEZ

Sanchez states that immediate service is available on a 24-hour, 7-day-week basis. Trained mud engineers are available for field service at any time. Sanchez was formerly with California Mud Products, Inc.

The outlet will give prompt service to drillers in the Los Angeles Basin, especially in the intensely active fields in such areas as Huntington Beach, Seal Beach, Long Beach, Wilmington, and Signal Hill.

Top Baroid executives from the Houston home office of Baroid attended the opening, including George L. Ratcliffe, vice president of National Lead Co., and George B. Coale, general manager of Baroid Division.

Larkin to Build Plant in Waxahachie

The construction of a new plant and general-office headquarters for the Larkin Packer Co., Inc., has been started in Waxahachie, Tex. The new plant will provide for more than a 40 per cent expansion of its oil-field-equipment manufacturing facilities, according to W. H. Larkin, president of the company. The new plant will occupy a 28-acre site. When completed late this year, it will provide about 70,000 sq. ft. of completely modern shop and office space. Larkin Packer Co. was founded 50 years ago in Bartlesville, Okla., and moved its general offices and plant to St. Louis in 1920. It has 11 warehouses located throughout the Southwest oil country for distribution of its drilling and production specialties. When the new plant is ready, the company plans to move its entire general office and manufacturing operations to Waxahachie.

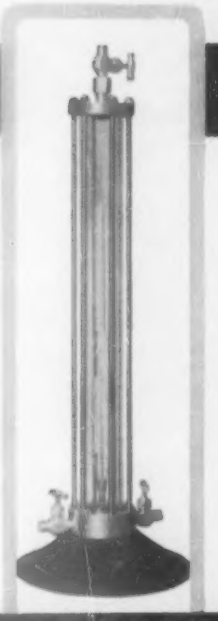
Rockwell Starts Field-Lubrication Service

To provide contract field-lubrication service on a national scale, Rockwell Manufacturing Co.'s Meter and Valve Division has a fleet of specially constructed trucks that are "valve workshops on wheels." The trucks carry complete field stocks of valve lubricants, lubrication fittings, lubricant-pumping equipment, and spare parts. To facilitate standard maintenance and field service, they are equipped with tool benches. A compressor provides power for the pneumatically operated lubricating guns and other air tools. A hose reel is available for remote lubrication of valves.

B. & W. Puts New Control Lab Into Operation

This new quality control laboratory is now in full operation at Babcock & Wilcox Co.'s Tubular Products Division plant at Beaver Falls, Pa., according to an announcement made by Edward A. Livingstone, vice president in charge of the division. This new laboratory has all the available practical equipment for inspection and testing procedures, as well as the development of new alloys. The laboratory, two stories high, comprising 29,000 sq. ft. of floor space, includes two production-control quantometers for determining the composition of steels by spectrographic methods.

PRESSURE HYDROMETER JAR



For obtaining specific gravity of liquefied petroleum gases, such as propane and butane, which under normal atmospheric pressure would evaporate into a gaseous form. Jar withstands operating pressures of 200 psi at normal temperatures. Equipment consist of clear lucite tube, aluminum end caps held by tie-rods and a conical base. Three needle valves allow entry of the sample and adjustment of the liquid level.

N.G.A.A. STANDARD NO. 2242

cenco

The most complete line of scientific instruments and laboratory supplies in the world.

R.S.G.

REFINERY SUPPLY COMPANY
621 EAST FOURTH STREET • TULSA 3, OKLAHOMA
2215 McKINNEY AVENUE • HOUSTON 3, TEXAS

CENTRAL SCIENTIFIC COMPANY
1700 IRVING PARK ROAD • CHICAGO 13, ILLINOIS
CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO
SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA

Geophysical prospecting methods and their application in petroleum and mineral exploration

Here is a practical treatment of the fundamentals, procedures, uses, and value of all the standard methods of geophysical prospecting. For each method discussed, the book covers basic physical principles, instrumentation, field techniques, reduction and interpretation of field data.

The information each method yields and its practical application and limitations in exploration are shown. Gravitational, magnetic, seismic, electrical, and radioactivity prospecting and well logging techniques are treated. The book covers earthquake seismology, terrestrial magnetism, and the gravitational field of the earth . . . radio position location for geophysical work . . . and advanced research in geophysics. Much information is given to help in planning and projecting surveys and utilization of geophysical data that will give you better results in petroleum and mineral exploration.

Just Published

INTRODUCTION TO GEOPHYSICAL PROSPECTING

By *MILTON B. DOBRIN*

Senior Research Technologist, Field Research Labs., Magnolia Petroleum Co.

435 pp., 65 illustrations, $7.50

Gives practical data on such subjects as:

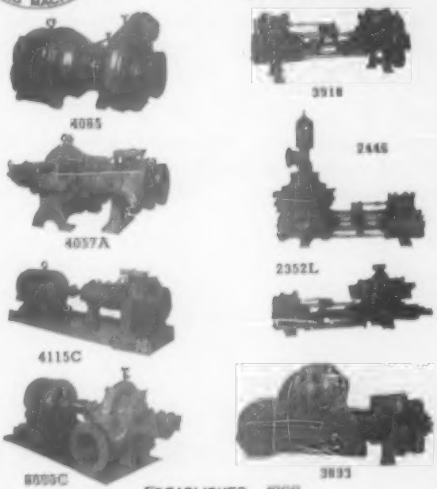
- aeromagnetic prospecting
- underwater gravity and seismic exploration techniques
- radio and radar position location methods
- use of the scintillation counter in prospecting
- gamma ray and neutron logging
- magnetic effect on oil-well casing
- flight pattern for aeromagnetic surveys
- seismic work on continental shelves
- identification of shales by potential logs
- and scores of others

THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

PUMPS

CENTRIFUGAL
RECIPROCATING

BUILDERS OF OUTSTANDING PUMPS
Since 1869



ESTABLISHED 1869

DEAN BROTHERS PUMPS INC.
INDIANAPOLIS IND.
323 W. TENTH ST.

Every forty minutes of every working day Core Lab begins another job . . . faces another problem created by the inconstant physical characteristics and productive behaviors of hydrocarbon-bearing formations. And to accept and adequately resolve these economically critical responsibilities demands far more service than routine reporting of mechanically-procured information.

Each set of basic data must be balanced against the logic of past experience and blended with the benefits of new, imaginative research in petroleum reservoir engineering.

When a final Core Lab core analysis report and interpretation is delivered it represents the finest combination of procedures, experience, and research available to the industry today. Each comprehensive evaluation is developed under the direct supervision of a permanent area-resident engineer. He, in turn, has at his fingertips the added field experience of 31 other Core Lab installations, plus the technical advice of Core Lab's Research Department and Special Core Analysis Studies Section.

As the search for new oil uncovers new problems, each formation cored deserves this quality of analysis work.

CORE LABORATORIES, INC.
801 CORE STREET, DALLAS, TEXAS

CORE LAB
PETROLEUM RESERVOIR ENGINEERING

DALLAS, HOUSTON, CORPUS CHRISTI, MIDLAND, ABILENE, SAN ANTONIO, TYLER, TULSA, FORT WORTH, WICHITA FALLS, OKLAHOMA CITY, ARDMORE, BARTLESVILLE, PAMPA, ARKANSAS CITY, GREAT BEND, NEW ORLEANS, SHREVEPORT, HATTIESBURG, LAFAYETTE, DENVER, BAKERSFIELD, BILLINGS, CASPER, WORLAND, STERLING, EL DORADO, LUBBOCK, FARMINGTON, LOVINGTON, MONAHANS, SAN ANGELO, CALGARY, EDMONTON, REGINA; VENEZUELA, S. A.

EXPLORATION

Center of Gravity Shifts in Montana

by Frank J. Gardner

Eastern Montana has seized oil dominance from the western part of the state as a result of exploration success during the past 4 years.

LOOK what's happened in 4 years. This is one of the busiest oil maps you'll see anywhere, but in May 1951 it was a dead area that hadn't seen a successful wildcat in 20 years. From this zero point, the Williston basin fields of eastern Montana have vaulted to a position of supplying nearly half the state's total oil. At the end of 1954, these fields had produced 72 per cent as much oil as all of North Dakota.

The center of gravity . . . The final shifting of the center of gravity for Montana's oil industry came about a year ago, when Poplar (E on map) displaced old Cut Bank field as the state's largest producer. And there is little doubt that the upward trend will continue, for geologists predict that 50 million acres in Montana are prospective oil country and that half of this lies within the Williston basin.

Gas was produced in eastern Montana as early as 1912 along the crest of the Cedar Creek anticline, several gas fields were discovered on the various local closures on this great uplift. Among them were Gas City, Ash Creek, Little Beaver, Cabin Creek, and Baker. They produced from thin lenticular sands in the Upper Cretaceous Judith River and Eagle formations at depths varying from 800 to 1,500 ft. Only four wells went after deeper oil on the anticline between 1936 and 1951; three of these were drilled at Little Beaver and one at Baker dome. Two found black oil on the Little Beaver closure; production came from the Mississippian at 6,853 ft. and the Ordovician at 8,130 ft. But after producing only 28,000 bbl. of oil and a lot of water, the tests were abandoned.

Not until the discovery of oil at Beaver Lodge in North Dakota in 1951 did Montana operators go after the deep Paleozoic oil in earnest. A great deal of geophysical work and leasing was done in 1949 and 1950, but Beaver Lodge provided the spark to fire the drilling campaign. Since that time, about 20 million acres of eastern Montana lands have been put under lease.

Follows success . . . With the discovery of Richey field (C on map) in November 1951, this new oil region scored its first success. In rapid-fire order, new deep Ordovician and Mississippian fields were opened at Glendive, Poplar, Pine, and Northwest Sumatra (D, E, B, and A on map). The fruitful years of 1952 and 1953 produced 15 more deep fields in the basin. However, 1954 was the year for geologically significant fields and new ideas in exploration. Each of the starred fields on the map has provided new concepts of oil occurrence to Montana oil men during the past year.

The discovery of Fallon County's Fertile Prairie field late in 1954 was the first strike on the east flank of the Cedar Creek anticline and the first strat trap on the west side of the basin. Wibaux field (Wibaux County) and Brorson (Richland County) confirmed geologists' theories on deep production possibilities in the deeper central part of the basin, away from the major structures. Pumpkin Creek, far to the south in Powder River County, was Montana's first production from the flanks of the Powder River basin (other than fringe wells at Ash Creek), and definitely called attention to Powder River's possibilities in the southeastern part of the state.

These 1954 strikes, plus a triple-pay discovery at Shell Oil Co.'s 33X-21 well in its Gas City Unit field this month, portend a brilliant future for Montana oil. The rapid development at Northwest Sumatra and Poplar, Pine, and Cabin Creek points to major fields for tomorrow. This is still great wildcat country, brimming with discovery prospects. Fewer than 100 wildcats have pierced the 25 million acres of the Williston basin of Montana. The bustling seismic activity in this basin, in the Coburg syncline, in the Powder River basin, and on the Big Snowy and Bowdoin uplifts presages a drilling campaign yet to come.

And production forecasts . . . In 4 years, Montana's oil industry has been revitalized. Production forecasts call for a daily production of 50,000 bbl. by the end of 1955 with an increase to 58,000 bbl. by 1957 and 77,000 bbl. per day by 1960. To accomplish this, authorities believe that 600 wells per year must be drilled, beginning **now.** That means nearly 100 million dollars a year will be spent on exploration alone. If Montana encourages the search with proper lease laws and political housecleaning, it can happen. And if it happens, the past 4 years will seem slow in comparison with the next 4.

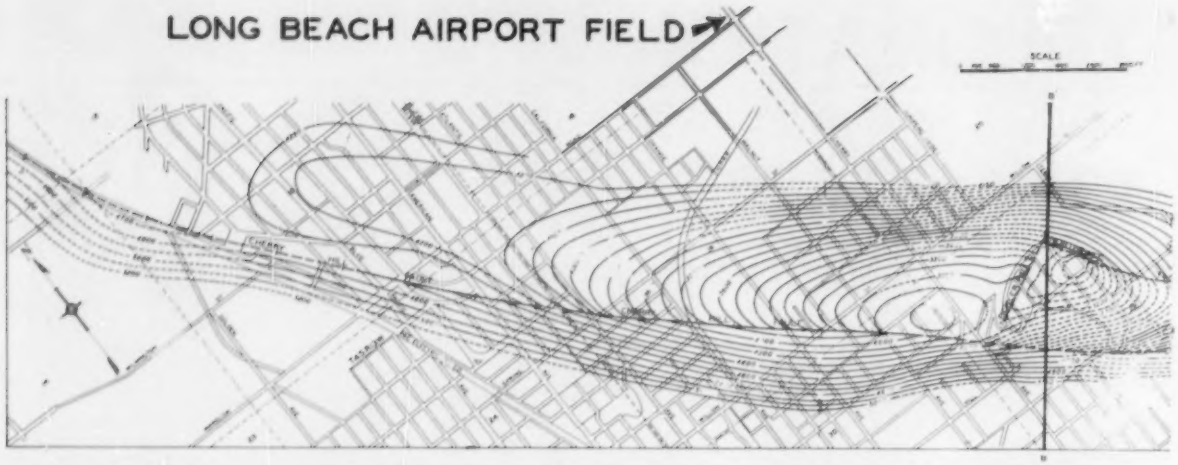


FIG. 1—Long Beach Airport pool is one of several pools that occur on the downdip flank of the complexly faulted anticline.

On the flank of California's prolific Long Beach field,

Downdip Drilling Finds New Reserves

by Donald M. Smith

THE new Long Beach Airport pool on the northeast edge of 34-year-old Long Beach field is of major significance for two reasons.

First, because of its contribution to our national resources; output from the year-old pool already has passed the 1,000,000-bbl. mark.

Second, it is important in that its relationship to a known structure indicates the possibility of other similar fault traps lying well down on the flanks of the 4-mile long, northwest-southeast trending anticlinal structure. Further, this theory is not entirely confined to the Long Beach field.

The Airport area (Figs. 1 and 2) is officially designated as Cherry pool by the Conservation Committee of California Oil Producers. It was discovered by The Texas Co. 1-1 Airport (NCT-1) on February 18, 1954. The well was completed through gun perforations at the interval 8,750-9,040 ft. While seismic studies indicated a faulted structural trap, it is believed they failed to reveal all important faulting.

Early activity . . . Discovery well of Long Beach field, Shell Oil Co. 1 Alamitos, is located near Temple and Hill streets—less than 1½ miles from the new activity. Completed on June 25, 1921, in the Alamitos zone, the well is still producing.

Early completions in production ranged up to 8,000 bbl. per day, with some wells taking in as much as 2,500 ft. of producing section. The error of this became apparent later when edgewater movement was found to be taking place.

Author is consulting petroleum engineer, Long Beach, Calif.

Production . . . A few wells in this field have produced over 2,000,000 bbl., and a large number have produced over 1,000,000 bbl. Highest recovery per acre of any field in the world is credited to the Lovelady pool in the central portion of the southwest flank. There recoveries are approaching 600,000 bbl. per acre.

At the crest of the structure, there are five main productive zones. These are the Wilbur, Alamitos, Brown, Deep, and De Soto. Of these, the Wilbur and Brown are divided into upper and lower pays. Ages of the producing formations are Pliocene and Miocene, with the contact near the base of the lower Brown zone. Maximum producing thickness of the Pliocene section is approximately 2,500 ft. The Miocene is something like 7,000 ft. thick (Fig. 3).

The Wilbur and Alamitos zones are

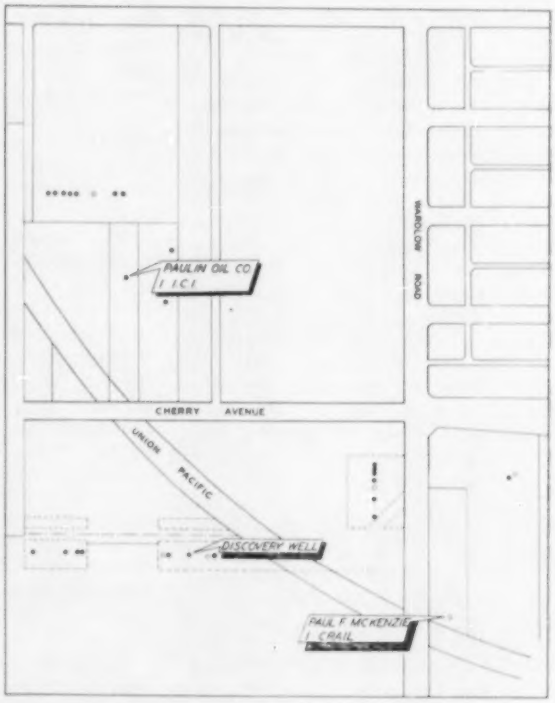


FIG. 2—Since the completion of the discovery well in February 1954, development has been rapid. Texaco paid $104,000 plus a 42.6 per cent royalty for the 1,040-acre drill site.

not found productive except in the higher structural positions. The Brown and Deep zones are the most extensive in area. In some areas only the Deep zone is productive; this is true at the Airport pool — the lowest structural wells in the field.

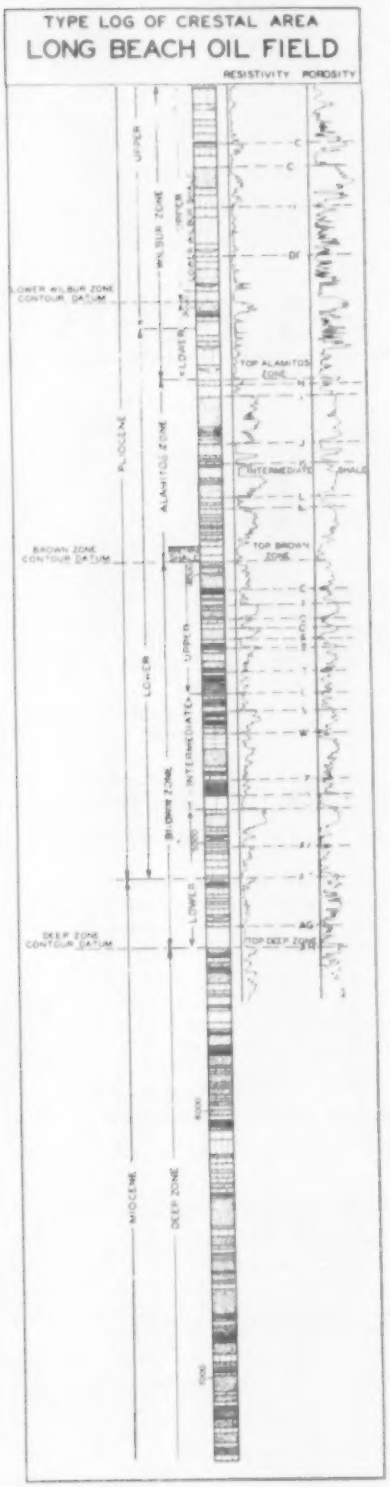


FIG. 3—Wells have logged over 1,400 ft. of gross pay in the deep zone.

Geology . . . The field is an attenuated faulted anticline lying along the Beverly-Newport uplift. Major fault is the Cherry Hill fault lying along the southwest flank of the structure and more or less parallel to the axis (Fig. 4). It is a thrust fault with 400 to 600 ft. of displacement. Some parts of its length consist of two or three associated faults of the same type. Recent developments indicate the fault is not continuous. Rather it is intersected by a number of associated faults, normal and reverse, and is substantially offset at several points.

Down-structure faulting . . . Reservoir and well-performance studies for years have indicated that certain portions of Long Beach field experienced no edge-water movement. Other areas contain wells which exhibit an edge-water movement, while adjoining wells in different zones show no edge-water movement.

The point is this. A zone in which sands are continuous, not lenticular or subject to facies change, and one in which no edge-water encroachment is indicated (a zone otherwise known as being under solution-gas drive or later as a gravity-drive zone)—such a zone may be reasonably assumed to be above down-structure faulting. If studies indicate that such faulting may exist, then further exploration is desirable to see if the down-structure fault has trapped any oil. There are eight or more areas in Long Beach field where these down-structure accumulations have been discovered lying below flank faults.

The Airport area . . . The property on which the discovery was made (Fig. 2) is owned by the city of Long Beach and is subject to a royalty of 42.6 per cent. The Texas Co. acquired the lease by bidding this royalty plus a bonus of $100 per acre for the 1,040-acre tract.

Part of the drilling commitment was the obligation to drill two 12,000-ft. wells, providing production was not obtained above these depths. A great deal of credit is due the company for having the fortitude to take on and develop this project in the face of such heavy obligations.

The first well was drilled to a total depth of 13,016 ft. Numerous electric logs and cores were taken. A gas-logging truck on the well indicated the presence of gas and oil at depth, but not as high in the section as had been expected.

Seven-inch casing was cemented at

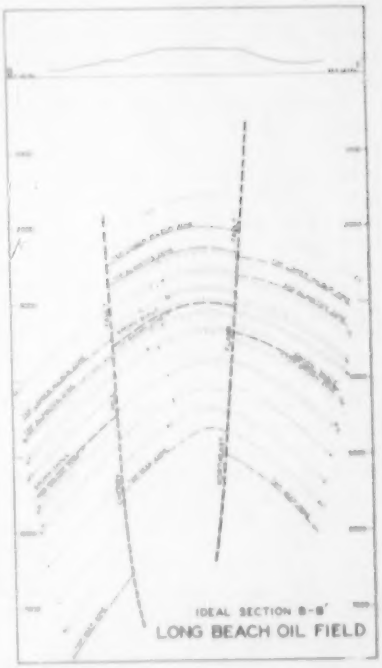


FIG. 4—The Long Beach structure is a complexly faulted anticline. The faulting extends further downdip than the cross-section shows.

12,161 ft. and the interval 12,161 to 13,016 ft. was formation tested. Subsequently the well was plugged back and perforated at intervals between 8,750 and 9,040 ft. This interval is the equivalent of the lower Deep zone in the developed part of the field. Production from this interval settled at 148 bbl. per day of 32°-gravity oil, with a cut of 16.4 per cent. Well-head pressures amounted to 100 psi. on the tubing and 1,000 psi. on the casing.

It should be remembered that this section had been exposed to drilling mud for approximately 90 days prior to completion. Therefore the rate does not reflect a true potential. The electric log had been run in a high pH mud and the curves were difficult to evaluate properly.

In the Airport area, the highest stratigraphic oil saturation is at the AL marker, 540 ft. below the AH point. In the structurally high positions, clean saturation extends down from the AL marker for a distance of 1,450 ft. This amounts to all the lower portion of the Deep zone and to the top of shale overlying the De Soto zone. Permeabilities and porosities are very high—much higher than the equivalent zones in the older portions of the field. These are, no doubt, the result of the down-structure position. Data on formation pressures and productivity indices have not been released for publication.

The 1,420-ft. producting section of one well showed a net permeable-sand thickness of 1,215 ft. or 85 per cent.

Proven closure in the developed area extends from the minus 6,500-ft. AH marker to the minus 7,050-ft. AH marker.

Attempts have been made to tie the Airport area with the Wardlow area to the west. In the Wardlow area saturation extends from the AH point down approximately 700 ft. Permeabilities and porosities are very much lower in this area with correspondingly lower production and reserves. The Wardlow area is higher on structure than the Airport area. The differences in the two areas suggest the possibility of substantial later movement along certain faults.

One dry well was drilled by Shell Oil Co. between the two areas. This well, 1 First Brethern Church, tested through the Deep zone and found no saturation. It does not appear to have been deep enough to make a fair test of the Airport zone.

Another well, originally Royalty Service Corp. 1 Burgess, tested vertically to 9,030 ft. without finding commercial production. The electric log of the well indicates faulting throughout a long section below 6,500 ft.

Competitive situation . . . The accelerated drilling rate started with the completion of Paulin Oil Co. 1 I.C.I. This well established the presence of production west of Cherry Avenue, in an area not included in The Texas Co. holdings.

With the drilling of the Paul F. McKenzie 1 Crail, productive limits of the field were extended north of Wardlow Road. The area between this well and earlier wells is now being developed by The Texas Co. and Hancock Oil Co.

With one exception, the discovery well, all original completions in the field have been with combination water-strings and liners. This practice, together with the lack of a competent shale body at the cementing point, has necessitated recementing in most wells in order to obtain a primary water shutoff.

It has been found that the upper saturated sands have little areal extent. This is a progressive condition with penetration into the zone. The result is that the lower wells must cement at stratigraphically lower points than the higher-situated wells. There is no established water table. Each sand has its own edge-water limit with the deeper sands extending over a wide area.

Reservoir performance . . . It is thought that the reservoir is subject to a solution-gas-expansion drive, i.e. a closed fault block with no edge-water movement. In this type of reservoir, the percentage water cut will not increase with time as it would in a water-drive reservoir.

From an engineering viewpoint it would be a good conservation practice to initiate pressure maintenance in this type of reservoir as soon as its nature is determined.

Unfortunately, the Long Beach Airport area is not a good example of oil and gas conservation. One operator, in refusing to cut back production, has compelled the rest of the operators to do the same in order to protect their own interests. The result has been a loss of revenue to both operators and property owners. This will continue until the gravity-drive phase sets in. By that time most wells will be long past the flowing stage.

The first wells completed in this area had gas-oil ratios of about 650 cu. ft. per barrel. Now, ratios range from 1,500 to 2,500 cu. ft. per barrel of oil produced. Formation pressures have diminished as much as 25 per cent. The second oldest well in the field is only 7 months old, and the third oldest is not yet 5 months old.

ILLUSTRATION CREDIT

Figs. 1, 3, and 4 are reprinted from Bulletin 118, California Department of Natural Resources, 1943, p. 321.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

OKLAHOMA

Basal McLish Proven At Eola Field Well

Basal McLish production is indicated at Sohio Petroleum Co. 1 Carpenter, SE NW NE 12-1n-3w, deep test in Eola field, Garvin County.

The well flowed oil at the rate of 40 bbl. hourly on ¼-in. choke from 10,633-10,704 ft. drill-stem test. Recovery was 2,000 ft. of oil.

Lone Grove district . . . The Viola lime reservoir of Lone Grove in Carter County has been further expanded at Frankfort Oil Co. Fulton, NW NE NW 12-5s-2w.

The well is flowing 50 bbl. of new oil per hour from 6,290-6,346 ft.

Sunray Completes Two Wells in the Osage

Sunray Oil Corp. completed two wells in Oklahoma's Osage County area. The 4 Osage, SW 19-26n-6e, flowed at the rate of 360 bbl. of oil daily on 20/64-in. choke from Burbank sand perforations at 2,926-46 ft. The 6 Osage well, NW 31-26n-6e, tested 354 bbl. of oil per day through choke after fracturing and perforations at 2,964-83 ft.

KANSAS

Pawnee County Extension Well Completed by Sunray

Sunray Oil Corp. 1 V. Davis, SE SE NW 4-23s-17w, Pawnee County, a Garfield field extension well, has been completed to produce 266 bbl. of oil daily at 4,280 ft. The 2 Davis, SE SW NW 4-23s-17w, in the same Pawnee County area, has been completed for 576 bbl. per day potential at 2,875 ft.

Rooks County . . . Sunray 2 Ordway, SW SW NE 16-10s-18w, tested at the rate of 504 bbl. of oil per day through perforations at 3,501-09 ft.

Sunray established a potential of 1,056 bbl. of oil daily at Father Flanagan Boys Home 2 well, N½ SE SE 16-22s-14w, Stafford County. This lease is undergoing an active development. Production is from 3,615 ft.

Dolomite Discovery Hinted At Sumner County Wildcat

Sumner County in southern Kansas is in line for a new Mississippi dolomite pool at Aladdin Petroleum Co. 1 Voils, NE NE NE 27-31s-1w.

A drill-stem test taken at 3,654-70 ft. got 10 ft. of oil and gas-cut mud and 60 ft. of mud-cut oil. A later test at 3,624-91 ft. made 30 ft. of very heavy oil and gas-cut mud and 120 ft. free oil. The indicated pool-opener is located about 2 miles northeast of Wellington field.

Pratt County's New Tatloc Field Gets No. 2

Tatlock field in Pratt County has its second producer at Lion Oil Co. 1 Elliott, SE SE SW 21-26s-15w.

The well recovered 218 bbl. of oil in 5 hours after acid treatment from perforations at 4,182-87 ft. in the Lansing-Kansas City. Th operator will undoubtedly complete in this zone. No shows were found in the Simpson or Arbuckle.

This is the north offset to the dis-

Repair Jobs Delivered Right on Time

. . . by Higgins, of course

Each of the vessels pictured above in Higgins dry dock was urgently needed by its owner. And because loss of time in dry dock meant loss of money to these owners, the Higgins team completed all these repairs according to specified schedule.

Whether you need repairs or new construction —whether it's a tug, a drilling structure or a work boat, it pays to get hold of Higgins.

Every Higgins customer, old or new, big or small, benefits from the Higgins slogan which has made this yard world-famous: "every job delivered *right* on time."

Q. Got a marine problem?
A. Get hold of

Higgins INC.

THE WORLD-FAMOUS BOAT BUILDERS

Box 8001 • New Orleans 22, La. • CRescent 0631

DRILLING BARGES • DREDGES • BARGES • QUARTER BOATS • TUGS • WORK BOATS • COMMUNICATION CRAFT • DRILLING STRUCTURES • PERSONNEL BOATS • PLEASURE BOATS • SEISMOGRAPH BOATS • BULK-TYPE CARGO BARGES • SWAMP SKIPPERS • TANK BARGES • ALSO MARINE REPAIRS OF ALL TYPES

covery well of Tatlock pool, Anschutz Drilling Co. 1 Tatlock, NE NE NW 28-26s-15w. This well was completed late last year for 455 bbl. of oil per day from the Lansing at 3,925-29 ft.

Mississippian Oil Shows Reported at Barber Test

Barber County has an indicated Mississippian oil discovery at Trans Era Petroleum, Inc., 1 McReynolds, NW NW NW 30-31s-10w.

Recovery was 125 ft. of heavy oil and gas-cut mud and 120 ft. free oil on a drill-stem test at 4,494-4,520 ft. This wildcat prospect is located 4 miles east of East Whelan field.

Pawnee County Has Conglomerate Strike

Welch & Olsson 1 Mickfessel, NW NW NW 16-22s-18w, Pawnee County wildcat, is a promising cherty conglomerate discovery.

A drill-stem test at 4,110-60 ft. got 350 ft. of heavy oil and gas-cut mud, 120 ft. heavy oil-cut mud and 300 ft. of gas. Operator is drilling below 4,355 ft. in the Viola. This wildcat prospect is 5 miles northwest of production at West Garfield field.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Morrow Strike Hinted at Rank Texas County Test

Phillips Petroleum Co. has an indicated Morrow gas discovery 3 miles west of Rice in western Texas County.

The 1 DeLier, SW SE 32-3n-10eCM, flowed 3,200 M.c.f. of gas per day on drill-stem test at 4,510-4,616 ft. Earlier the well had indicated what is believed to be Lansing production. The wildcat is 9 miles southwest of Northwest Eva-Morrow field. It is 23 miles west of Hugoton field Permian gas production and 16 miles northeast of Stratford-Cisco field of Sherman County, Texas Panhandle.

Beaver Has Kansas City Production Assured

The Northwest Mocane field in Beaver County has Kansas City lime oil production in store at Cabot Carbon Co. 2 Hodges, the north offset to the field discovery well in NW NE 1-5n-24eCM.

The well flowed 56 bbl. of oil in 2 hours on ½-in. choke from perforations at 4,787-92 ft. It then flowed 42 bbl. in 10 hours, natural, on 12/64-in. choke. Testing continues. This Kansas City prospect is more than 90 miles southeast of Morton County Kansas production (Kansas City lime). The well has indicated Council Grove (Permian) Toronto, Lansing, and Checkerboard, all Pennsylvanian zones, production.

TEXAS PANHANDLE

Laketon-Delp Has Third Discovery Well

Phillips Petroleum Co. has a third discovery well on its 22,000-acre block in northeast Gray County in the Texas Panhandle. The new well, the 2 Delp, without acidization flowed gas through 1-in. top and ⅝-in. bottom chokes on successive drill-stem tests at daily rates of 12.6 million and 13.2 million cubic feet and a spray of distillate from 20 ft. of granite wash in intervals 7,732, 7,742, and 7,742-52 ft. Coring and testing of the well are continuing.

The new well is ⅝ mile northwest of Phillips 1 Delp, an oil discovery completed last August in a different pay section of the granite wash at approximately 9,500 ft., and 1½ miles from the company's recent Ellenburger oil discovery, the 1 Troy "A." The 2 Delp is 15 miles northeast of

The hand-applied tool joint with

"4 POINT SEAL" Protection

AMERICAN

Straight Grip

TOOL JOINT

In areas where tool joints must be replaced before the drill pipe is retired—or where tool joints outlast the drill pipe, American Iron hand-applied Straight Grip tool joints offer your best investment.

Precision machining and accurate gaging guarantee the perfect 4-POINT SEAL PROTECTION against joint leakage and creep—these seals actually become tighter as pump pressures increase. When replacement of Straight Grip tool joints is necessary, the worn ones are removed and new ones applied right at your rig!

Pampa in Section 110, Block M-2, BS&F Survey.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Runnels County Gardner Strike

Re-testing of an abandoned well northeast of Winters has given Runnels County a flowing Gardner discovery. Old total depth was 4,750 ft. Thompson-Powell-Derrick Drilling Co., Abilene, 1 Kendricks was drilled out to 4,335 ft. and casing perforated in Gardner sand at 4,293-4,302 ft. After

No. 1 Kendrick, re-entered, made an 818-bbl. Gardner sand discovery.

acid and fracture treatment, the well flowed 409 bbl. of oil in 12 hours through 16/64-in. choke, with gas-oil ratio of 912:1. Gravity of the oil was not reported. Nearest production is 2 miles south, in Davis field.

Garza County . . . Warren Petroleum Corp. 1 Williams, wildcat in the southeastern corner of Garza County, reported oil recovery on drill-stem test in the Mississippian. A 4-hour test between 7,595-7,633 ft. had gas in 19 minutes, and recovered 400 ft. of heavily oil and gas-cut mud, plus 400 ft. of free oil, with no water. Flowing pressure ranged from 150-350 psi.

Potentials Run on Two Deep Discoveries

Humble Oil & Refining Co. 1 Rosa Barnett, Upton County Devonian and Ellenburger discovery, has made completion potential from the Ellenburger. A 6-hour test on perforations at 11,775-11,840 ft. through 16/64-in. choke tanked 313.85 bbl. of 52.4° oil, to give the well a calculated daily potential of 1,255 bbl. Flowing tubing pressure was 1,450 psi., and gas-oil ratio was 418:1.

Gaines County completion . . . Husky Oil Co. has announced completion of 1 Webb in Gaines County, as a Devonian producer. The wildcat was drilled jointly by Anderson-Prichard Oil Co., U. S. Smelting Co., and Husky Oil Co. The participants spudded in 1 Powell, an offset ¼-mile to the northwest of 1 Webb.

On potential tests 1 Webb produced a total of 607.51 bbl. of 36.5°-gravity oil on natural flow in 24 hours through a 30/64-in. choke. The well flowed 482 bbl. of clean oil in 24 hours through a 10/64-in. choke.

Pay formation was topped at 13,024 ft. The well was drilled to a total depth of 13,133 ft. and at that point was still in saturated Devonian and no water had been encountered. Casing was perforated from 13,028-86 ft., and from 13,112-28 ft.

Husky Oil Co. owns varying interests in 7,400 gross acres around this well in Gaines and Yoakum counties.

GULF COAST

SOUTHWEST TEXAS

Bartosh Discovery Revives East Floresville Drilling

New drilling actively is getting under way in the old East Floresville field following the recent discovery by Texita Oil Co. of Bartosh (middle Wilcox) production. Previous production in the field had been from the deeper Midway-Poth sand.

Texita's Bartosh discovery well, 4 Naylor, in the John W. Brown Survey, has been placed on the pump with daily production of 21 to 22 bbl. of 20°-gravity oil. Pay is perforated at 1,600-07 ft. Poth production, with approximately 25 wells, is from depths of 2,700 to 2,750 ft.

New drilling is by Sutton Drilling Co., of San Antonio, which is starting two Bartosh wells on its Riley lease. Both closely offset Poth sand wells.

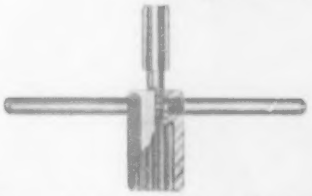
Duval County Discovery Indicates New Oil Field

M. M. Miller & Sons have an indicated oil-discovery well 10 miles southwest of Benavides, in Duval County, where they got 1,400 ft. of clean oil and 100 ft. of oil-cut mud in a drill-stem test of sand at 4,551-56 ft. in their 1-E Miller fee.

The discovery was through ¼-in. choke with working pressure of 73 psi. Bottom-hole pressure was 802 psi., flowing, and 1,860 psi., shut in.

Previously, in a drill-stem test of

SLUSH PUMPS
Cleanout
TAP and DIES
by Baird

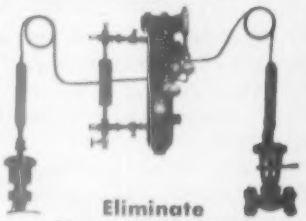


For cleaning and rechasing threads in the field: on piston rods, cross heads, extension rods and valve cover and cylinder head studs. We can furnish any number of threads per inch for any diameter stud.

Always Available Through Your Supply Store

BAIRD MFG. CO.
P. O. Box 380 TULSA, OKLA.

INFERNO
Boiler Safety Units



Eliminate Unnecessary Risk

There is only one positive way—the INFERNO Automatic Safety Unit way—of maintaining the proper water level in your boilers for efficiency and safety of operations. Don't depend on human action to maintain the proper level—let INFERNO take over and rely on the Safety Unit's three-way action for positive protection. Bulletin 15-C explains the details.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

for Easier Cleaning!

—R-P&C IRON BODY CLIP GATE VALVES

• R-P&C clip gates were developed specially for those applications in the chemical and petroleum industries where ease of cleaning is a big factor. With these rugged valves you simply remove two nuts, then lift up the bonnet, stem and gate assembly in one piece for easy access to the entire valve body.

Ease of maintenance and sturdy construction make these clip gates preferable over bronze gate valves in many applications. Rated for 150 lbs. steam, or 225 lbs. OWG, clip gates are furnished in sizes from ¼" to 3", with screwed ends. Normally furnished with bronze trim, they may also be supplied in all-iron for use with fluids which attack bronze.

FREE SLIDE RULE

Valve selector slide rule gives all dimensions for iron body and steel valves in pressure classes from 150 to 1500 lbs. Write for yours.

All castings used are of close-grain, hi-test gray iron, 50% stronger than ordinary iron, from R-P&C's own foundry. Their construction embodies quality features that are characteristic of R-P&C's complete line of gate, globe, angle and check valves in all of the standard valve materials.

See your R-P&C Distributor or write for catalog

ACCO

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves

sand at 3,945-72 ft. the well showed for possible gas-condensate production.

Location is northwest of Longhorn field.

TEXAS GULF COAST

Small Pumper Revives Allen Dome Production

Humble Oil & Refining Co. has completed a small pumping well on Allen dome, in southern Brazoria County. It is the first reported production at this dome since June 1940.

Humble's well, located on the northeast side of the dome, is completed in sand at 4,590-4,612 ft., making between 11 and 12 bbl. of 38.9°-gravity oil per day.

Allen is among the first geophysical salt-dome discoveries on the Gulf Coast, being found by torsion balance in 1924. First commercial production was recorded in 1927. Numerous tests have been drilled on and around the dome, one going below 12,660 ft., but only 6 wells have produced commercially with sands ranging in depth from 4,350 to 5,385 ft. Less than 95,000 bbl. of oil has been produced.

Raywood Productive Area Gets One-Mile Extension

Productive area of Raywood field, 2 miles south of Raywood, in Liberty County, is being extended about 1 mile to the southeast by a new gas-condensate well drilled by Union Oil Co. of California.

Testing sand, perforated at 9,982-94 ft., the well, 1 Murphy, flowed at the rate of 2,200,000 cu. ft. of gas with 141 bbl. of condensate per day through chokes, flowing pressure gaging 1,550 psi. Hole was drilled to 12,525 ft.

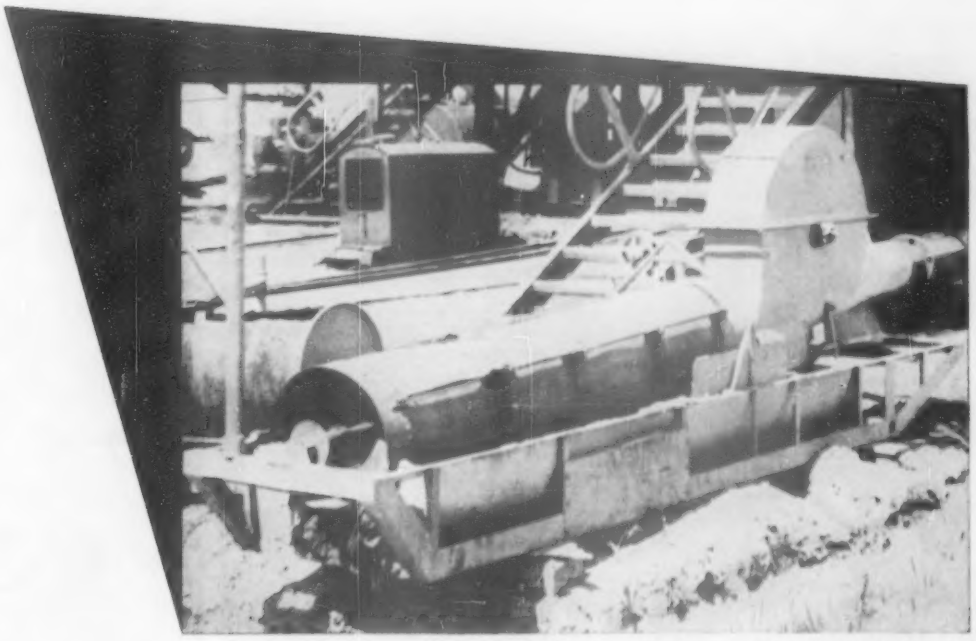
Raywood produces from multiple zones ranging in depth from 7,500 ft., in the Vicksburg, to nearly 12,000 ft., in the Cook Mountain.

Second Oil Productive Pay Opened in Riverdale Field

H. R. Smith, of Alice, Tex., has announced another oil-productive reservoir, the second, for the Riverdale gas-condensate area, 8 miles northwest of Goliad, in Goliad County.

The new reservoir, opened through casing perforations at 8,654-60 ft., is about 600 ft. shallower than the first oil reservoir, at 9,273-9,318 ft., opened by the same operator late in 1954.

Discovery well of the new reservoir is the operator's 1 Pettus Unit 2, originally completed late last year as a gas-condensate producer with perforations at 9,012-20 ft. It now is com-



Thompson shale separators are entirely self-motivated, requiring no motors or external sources of power. All Thompson separators are equipped with a Sample Machine which collects cuttings for a foot-by-foot analysis. Specific information can be obtained by writing to Thompson Tool Co., Iowa Park, Texas. Thompson separators are orderable from all supply stores.

How Monel Screen Cloth Resists Abrasion and Corrosion to Keep Drilling Mud Serviceable

If your operations involve screening, separation or filtration, you'll appreciate the problem that was faced by Thompson Tool Company. Their equipment is exposed to unusually tough service: reclaiming drilling mud that is loaded with shale and other abrasives.

The wire screen cloth not only has to withstand abrasion, but also corrosive attack by caustic and other chemicals in the mud as well as the muriatic acid used to clean the screens.

They tried a number of different screen materials before deciding several years ago, that Monel had the physical and corrosion-resisting properties they need. Since then Monel screen cloth has been standard equipment.

Oilmen, equipment manufacturers and industrial users have found that:

Monel has corrosion resistance that successfully resists most acids, alkalies, salts, water and atmospheric conditions.

Monel has greater durability — its strength and toughness enable it to withstand heavy pressures and hard wear and tear.

Monel is easy-forming — it can be made in any size or shape wire cloth for filtering hydraulic oil, water, chemical solutions, brines, alkalies, acid sludges, or other applications when corrosion resistance and product purity are important.

If you would like more information on Monel Screen Cloth and the names and addresses of wire weavers, write Inco for a copy of "Established Weavers of Monel — Nickel — Inconel®".

INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

Monel ... *for Minimum Maintenance*

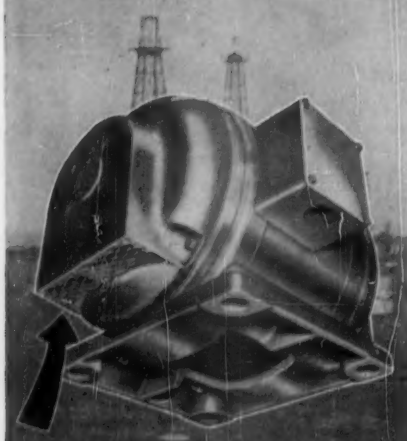
get ALL the facts

and you'll choose

FIELDMASTER

BALL BEARING

MOTORS



Like a book, you can't tell a motor by its cover; it's what's **inside** that counts.

FIELDMASTER Ball Bearing Motors, for example, have been specially designed and built to more than handle the rugged requirements of oil field use. High slip is available to take care of reciprocating load requirements encountered in pumping . . . wide variety of windings provides triple ratings, dual voltages . . . high torque licks heavy starting problems . . . high-grade silicon steel in the magnetic circuit reduces iron losses . . . heavy-duty, double-shielded pre-lubricated bearings increase performance, reduce lubrication problems . . . heavy cast base assures alignment stability.

These are just a few of the many facts which prove FIELDMASTER Ball Bearing Motors are second to none. Our distributor, the Bethlehem Supply Company, will gladly supply you with **ALL** the facts . . . **without obligation.** May we have them contact you?

Screened Air Port Keeps Out Rodents!

VALLEY ELECTRIC CORP. 4221 FOREST PARK BLVD., ST. LOUIS, MO.

Distributor, BETHLEHEM SUPPLY CO., TULSA, OKLA.

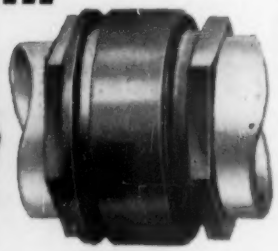
Cut Coupling Size

and Weight with

RUBBER TECK'S

RIGID, LIGHTWEIGHT, STAINLESS STEEL

DUCT CONNECTOR



Proven and accepted in the aviation industry because of its compactness and weight economy. Now available for all industries requiring rigid but lightweight connectors. Easy to install. Gases, liquids or semi-liquids can be handled t advantage. Available in aluminum for tube sizes ¼" to 2½" and in stainless steel ¼" to 4" O.D.

OTHER RUBBER TECK PRODUCTS: Flexible Breakaway Connectors • Duo-Seals • Flexible Hot Air Duct Connectors • Flexible Fluid Line Connectors

RUBBER TECK, Inc. GARDENA, CALIFORNIA

ENGINEERING SERVICE REPRESENTATIVES:

RUBBER TECK SALES & SERVICE CO.
8479 Higuera St., Culver City, Calif.
Texas 0-6836
5439 Harford Rd., Baltimore, Md.
Clifton 4-9671
60 East Bridge St., Berea, Ohio
Berea 4-7837

THOMSON ENGINEERING SERVICE
554 Summit, Fort Worth, Texas
723 Broadway, Wichita, Kansas
4378 Lindell, St. Louis, Missouri

RANDALL ASSOCIATES, INC.
Room 203, White Bldg.
Seattle, Wash.

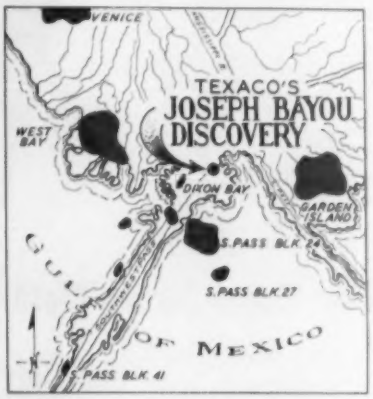
RUBBER TECK

pleted dually, production from the shallower oil reservoir being gaged at 192.38 bbl. per day through chokes. Flowing pressure is 2,700 psi., and gas-oil ratio 3,220 cu. ft. per barrel.

SOUTH LOUISIANA

Joseph Bayou Discovery Opens New Delta Field

Latest in the succession of oil and gas discoveries in the Mississippi River delta area of Plaquemines Parish is on the Joseph Bayou prospect, in Township 23s-31e, where The Texas Co. has completed a well making 129 bbl.



Southwest Pass area of Mississippi River delta at tip of Plaquemines Parish, showing location of The Texas Co.'s Joseph Bayou discovery.

of 29°-gravity oil per day, flowing through an X-27 choke.

The well, first successful completion on the prospect, is on Texaco's State Lease 2474, on the east side of Mississippi River's Southwest Pass. It is about 4 miles north of the active, widespread South Pass Block 24 field, located mostly offshore in the Gulf of Mexico. It is about 5 miles east of Gulf Refining Co.'s large West Bay field.

Texaco's new discovery well was drilled to 10,004 ft., and has pipe run to 10,000 ft. It is producing from a casing-perforated interval at 8,798-8,814 ft.

Initial flow was with pressure of 1,200 psi. and gas-oil ratio of 406 cu. ft. The flow carried only a trace of water.

The company's first confirmation test, located southeast of the discovery well on the same lease, is nearing the discovery well's pay zone.

MISSISSIPPI

New Wilcox Pool Opened

Calto Oil Co. and G. W. Gulmon have a new Wilcox oil-discovery well 1 mile north of Cranfield field, in eastern Adams County. It is their 1-Y Arm-

strong, completed on the pump for 87 bbl. of 39°-gravity oil (net) with about 8 per cent sediment and water. Pay is perforated at 5,816-18 ft. Total depth is 6,167 ft. The area, believed separated from Cranfield field, has been designated as Moss Grove field.

Production Improves In Copiah County Discovery

Prospects of commercial production in Sun Oil Co.'s southern Copiah County lower Cretaceous wildcat test appeared better in tests following fracturing of the indicated pay zone, perforated at 14,934-60 ft.

Prior to fracturing, the test, 1 Southern Package Corp., flowed at the rate of 50½ bbl. of condensate with an estimated 400,000 cu. ft. of gas per day through open tubing. After fracturing, it flowed at rates up to 66 bbl. of condensate and 1,300,000 cu. ft. of gas per day, gaged through ½-in. choke.

On a 10-hour test through ¼-in. choke, flow was at the rate of 927,000 cu. ft. of gas with 25 bbl. of condensate, plus 16 bbl. of water. Following this test, the well was shut in for orders.

Pay is in a lower Glen Rose sand. Showings also were obtained in lower Cretaceous-Paluxy sand, logged at 13,220-65 ft.

Location, in 6-9n-7e, is about 2 miles southwest of Brown Wells, and about 10 miles southwest of Hazelhurst. It is about 12 miles north of Brookhaven field, nearest production. Brookhaven production is from Tuscaloosa (upper Cretaceous) sands. Nearest lower Cretaceous production is about 40 miles to the north in Bolton field, in Hinds County. Soso, most prolific lower Cretaceous field, is about 75 miles to the east.

ARK-LA-TEX

EAST TEXAS

New-Pay Strikes for Cass, Kaufman Counties

A new-pay prospect was in prospect for the Ham Gossett field in southeastern Kaufman County, while a Pettit limestone strike was completed in Cass County.

The prospector is Thomas D. Humphrey & Sons 15 Fritz, 4 miles northeast of Kemp in Ed Fitzgerald Survey. A test on perforations in the Middle Dexter (Woodbine) from 3,988-90 ft. was in process at this report. While drilling, the interval at 3,988-92 ft. developed 2,470 ft. of free oil and 40 ft. of salt water in 1 hour and 15 minutes. Flowing pressure ranged from 150-300 psi.

Completions was made at F. R. Jackson 2 Grogan Manufacturing Co. from the Mitchell sand and the Pettit lime, the latter being a new pay for the Haynes field in Cass County.

Perforations in the Pettit at 6,589-93 ft. flowed 244.69 bbl. of 39° oil a day through 12/64-in. choke. Tubing pressure was 975 psi. and gas-oil ratio was 750:1.

In the field, pay, at 5,960-72 ft., the well made 199.38 bbl. of 43° oil on 10/64-in. choke. Casing pressure was 800 psi. and gas-oil ratio was 500:1. Location is in the Albert Emmanuel Survey, A-327.

GREAT LAKES

MICHIGAN

● Aurora Gasoline Co. and McClure Oil Co. tested a Salina dolomite section at 1 Kintigh, NE NE SE 20-3s-3w, Concord Township wildcat, Jackson County. This particular potential pay has not been tested at any other Michigan oil test. The well showed for about 15 bbl. of oil and 250 bbl. of water in 24 hours after acidization in perforations at 2,329-34 ft.

A second acidization appears to have increased oil production at Neyer, Miller & Gallagher 3 Powell, SE SE NE 30-16n-5w, Gilmore Township,

Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs

REFINERS! PIPE LINE MEN! DRILLING ENGINEERS! LABORATORY TECHNICIANS!

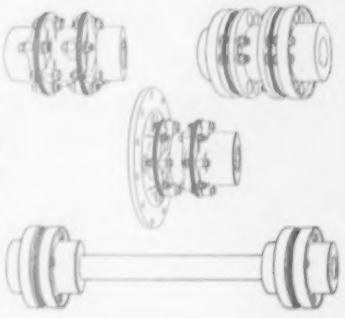
You can use Thomas Couplings to your advantage on Pumps, Compressors, Cooling Towers, Rigs or any other tough job where continuous operation and dependability are required. Thomas Couplings can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Write for our new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING COMPANY

Largest Exclusive Coupling Manufacturer in the World

WARREN, PENNSYLVANIA, U.S.A.

Better than good—this pair is the best!

NO-GALL or LO-TORK Compounds give threads on tool joints and drill collars the best protection money can buy. They do this by minimizing friction—maximizing gall resistance. They spread easily, uniformly—never gum up or squeeze out. They lubricate without freezing—permit fast break-out on string after string of drill pipe.

It's just sound economics to insist on the best compound you can buy. It means longer life for tool joints, less down time, money saved. Next job insist on the BEST—insist on either WECO NO-GALL or LO-TORK Compounds. Available at supply stores everywhere.

PESA

C1-55

it's wise to standardize with.. WECO

WECO WELL EQUIPMENT MFG. CORP. • Division of Chikson Company • HOUSTON 1, TEXAS

Isabella County, a Dundee oil discovery which pumped and flowed an average of 11 bbl. daily natural.

The well appeared good for about 20-25 bbl. of oil per day on very early tests after this most recent acid treatment. This estimate was based on a 2-hour flow test after all acidizing fluids had been recovered. The 3 Powell flowed about 10 bbl. per hour.

EASTERN INTERIOR

ILLINOIS

Gap Removed Between North Eldorado and Eldorado

George & Wrather have closed the gap between North Eldorado and Eldorado pools in Saline County at their 1 High School Community Unit, NE SW SE 16-8s-7e, in north part of Eldorado city. The well flowed 40 bbl. of oil per hour or 960 bbl. daily from 2,135-70 ft. in the Waltersburg sand after treatment. The well is midway between the pools, which were 1 mile apart.

APPALACHIAN

PENNSYLVANIA

Parker Township, Butler County, Southwest Pennsylvania, Walker et al 1 John Walker, wildcat, has resumed drilling again and is now at 7,403 ft.

• Buffington Township, Indiana County, Felmont Oil Corp. 1 Marjorie Shankel is at 1,002 ft.

• Unity Township, Westmoreland County, Peoples Natural Gas Co. 2-4037 Fred Musnug is drilling at 635 ft.

WEST VIRGINIA

In Grant district, Jackson County, West Virginia, B. H. Putnam completed 1 H. C. Milhoan, wildcat, gaging 1,000,000 cu. ft. of gas, Corniferous lime 4,173 ft., Oriskany sand 4,269-97 ft., gas 4,274-77 ft. Total depth 4,307 ft.

• Union district, Preston County, Columbian Carbon Co. 1207 Lawrence Burger, shut down at 4,988 ft. through the Oriskany sand with 268,000 cu. ft. gas, awaiting results after Hydrofrac.

OHIO

Another large well was added to Mount Zion pool in Jackson Township, Knox County. Preston Oil Co. 3 G. Dalmasso, Section 24, found the Clinton at 2,740-89 ft. with 7 bbl. natural, which increased to 459 bbl. in a 24-hour test after fracturing.

• In the new pool north of Glenford in Hopewell Township, Perry County,

OILFIELD POWER... *built to order!*

It's built *big* to perform bigger jobs. It's built with the heavy-duty construction and moderate-speed design typical of all MM Oilfield Engines . . . with the kind of durability that takes cycle peak loadings in stride.

That's the Minneapolis-Moline 800-6A . . . the new six cylinder engine offering $5^{3}/_{16}$-inch bore, 6-inch stroke, and 800 cubic inch piston displacement. With this 800-6A, lower piston speeds for less wear result in longer engine life, less down time and fewer service costs. All of the MM continuous-duty advantages which have proved so outstanding in oil industry operations work for you.

Large oil filters submerged in water-jacketed base pan supply cleaner oil to cylinders and bearings at constant temperature, regardless of load or weather conditions. Controlled temperature provides most complete filtering and elimination of sludge. Shafts, bearings, cylinder block, crankcase, base pan, flywheel, clutch and power shafts are engineered for big capacity to make the 800-6A the sturdiest engine in its size and price class.

For complete performance facts and engineering data on the new Minneapolis-Moline 800-6A Oilfield Engine, write, call or wire

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

DISTRIBUTED BY

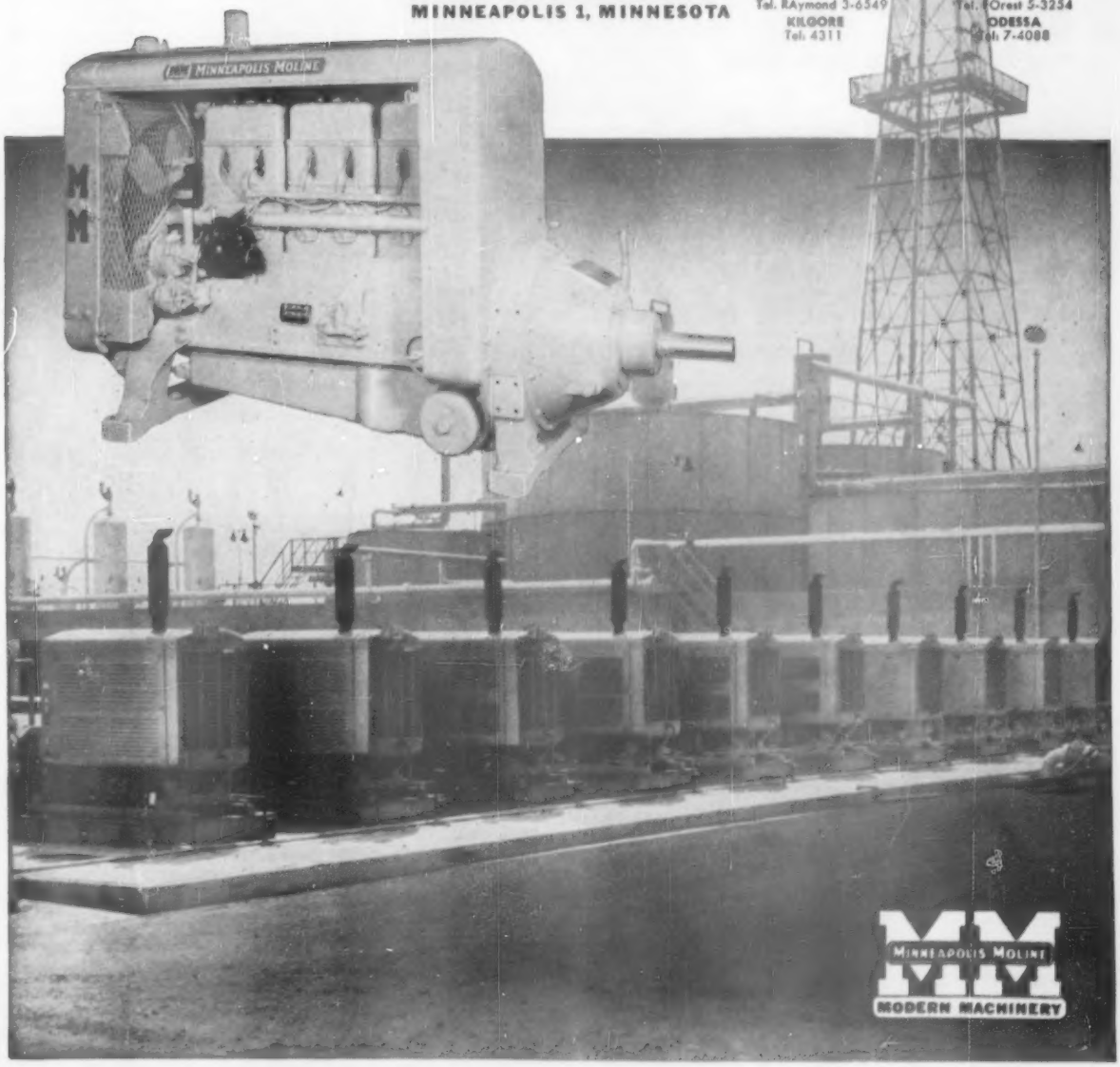
SHRIMPTON
MANUFACTURING & SUPPLY CO.

LOS ANGELES
Tel. RAymond 3-6549

OKLAHOMA CITY
Tel. FOrest 5-3254

KILGORE
Tel. 4311

ODESSA
Tel. 7-4088



Foraker Jr. et al completed their 3 L. Torbet in Section 4, Clinton sand was logged at 2,797-2,816 ft. with 2 bbl. natural and 90 bbl. and 300,000 cu. ft. of gas in 24 hours after treatment.

● Plechaty & Lucas are drilling a wildcat to the Cinton sand east of Cleveland on the Wm. Plechaty tract in Lot 19, Solon Township, Cuyahoga County.

EASTERN KENTUCKY

On John's Creek and in the Pike County sector of Big Sandy gas field, Columbian Fuel Corp. have successfully deepened 1 Charlie Murray from old total depth of 1,677 ft. in Mississippian Maxon sand to total depth of 3,193 ft. Devonian black shale was topped at 2,695 ft. and yielded gas, naturally at the rate of 678,000 cu. ft. daily. A 10-hour rock pressure measurement recorded 420 pounds.

PACIFIC COAST

CALIFORNIA

Fifth Beverly Well Completed

Universal Consolidated Oil Co. has completed its fifth producer in the 7,200-ft. lower Miocene sand it discovered in the old Beverly Hills field, none of which have been placed on production. The new test, which like the others, is slanted from a drilling island on the 20th Century-Fox studio, on a limited test flowed at an 840-bbl. daily rate through an 18/64-in. choke. The company expects to complete a pipeline outlet before next September, at which time all wells will be placed on production.

Reserve Drilling New Jewett Zone Test

Reserve Oil & Gas Co. has started a ¾-mile northeast stepout to the two-well Jewett (Middle Miocene) pool at Tejon Ranch, Kern County. The new wildcat, 28-27 Reserve-Pauley in SW SW 27-11n-19w, is about 1 mile southwest of a recently deepened test which failed to find the 7,000-ft. sand. Its 28-23 Reserve, abandoned at 6,986 ft. after being deepened from 5,824 ft., was believed to be separated by faulting, however.

Another Reserve test whose outcome was being watched was 12-34 Reserve-Pauley in NW NW Section 34. It topped the Miocene pay higher than did the discovery, some ¾ mile southwest, but found it to contain gas. After being drilled to 11,687 ft. in search of Vedder production, the well was nearing the pay again is a new hole slanted downstructure (northwest) in search of oil.

Guijarral Hills Search Expands

Success of recent exploratory tests on the flanks of Guijarral Hills led Union Oil Co. to start a wildcat 1½ miles northeast of Fresno County field. As operator for its interests and those of Helm Co., and Hans and Robert Sumpf, Union will drill 8-14 Pleasant Valley in SW SW 14-20s-16e. Site is about ¾ mile beyond Standard Oil Co. of California 51 Guijarral Service Co., abandoned at 10,421 ft. in early 1953.

Two other tests searching for the 9,000 ft. lower Miocene and deeper Eocene pays were those of Santa Fe Drilling Co. and L. A. Harnish, Oper. In Section 30, about 2½ miles west of Guijarral Hills production, the latter was coring below 9,200 ft. The "no-dope" hole of Santa Fe in Section 24, 2 miles northeast of production, was drilling near the 6,000-ft. mark.

Deep Ventura Activity

Ventura County's list of deep tests received a new addition and one deletion. The latter was Standard Oil Co. of California 1 Vanderkarr, 1 mile

STEEL "on tap"

for Oil and Gas Industry

When you need steel quickly—whatever the kind and quantity—here's your surest source. Here you draw on the world's largest steel stocks; have at your disposal every kind of equipment for preparing steel to your order. And experienced steel men who know your industry's requirements work with you. So for quick, dependable steel service . . .

call RYERSON

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA CHARLOTTE, N. C. • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

northeast of Santa Paula in 2-3n-21w. It was drilled to 15,157 ft. The new wildcat was Richfield Oil Corp. 1 Homburg in 31-4n-19w, just south of Fillmore. This deep test will be searching for the 14,000-ft. pay Standard is developing in the Fillmore field, 2½ miles west.

Deepest wildcat in Santa Clara Valley was that of General Petroleum Corp. near Piru. Its 1 Edwards, in SW 19-4n-18w, was drilling below 15,430 ft.

New Solano Gas Test

A. N. Campbell, operator, was preparing for a wildcat 6 miles north of the Potrero Hills gas field, near Vacaville in Solano County. Labled 1 Western Gulf, the test will be in NW 11-5n-1w, on a 2,240-acre farmout from Western Gulf Oil Co. The test will look for Upper Cretaceous sands at a depth of about 2,000 ft.

New Santa Paula Pool in Prospect

A Shell Oil Co. wildcat about 2 miles west of West Mountain field may have opened a new field. First drilled to 12,020 ft., its 2 S.P.S. has set pipe after redrilling to 7,800 ft. Formation tests at 6,985-7,059 ft. and 7,441-94 ft. yielded sufficient quantities of light crude to suggest the possibility of a new find. Site of the test is in 29-3n-18w, about 4 miles southwest of Santa Paula.

WASHINGTON

Another Washington Test Dry

Continental Oil Co. was preparing to abandon a Grays Harbor County test after drilling to 4,034 ft. This test, 1 Pitchford-McClymont, in 4-15n-8w, was the ninth Washington wildcat drilled by the company since moving in a company rig about 1 year ago.

ROCKY MOUNTAIN

WYOMING

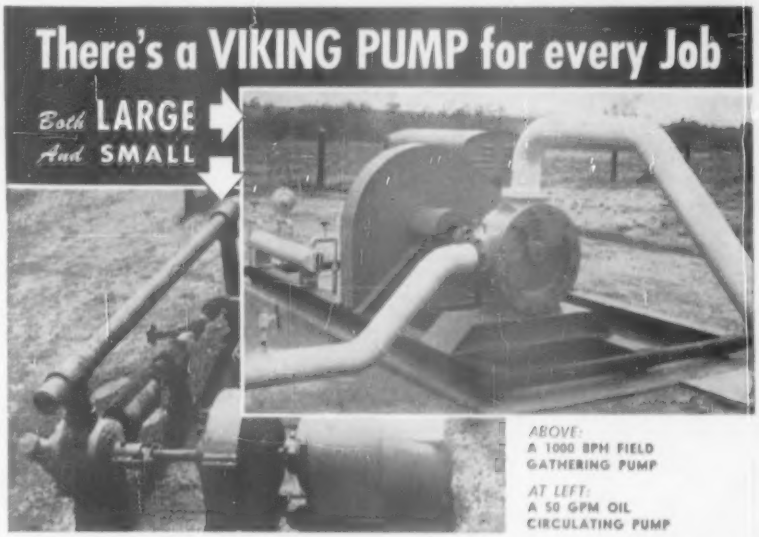
Northwest Byron Wildcat Possible Discovery

Phillips Petroleum Co. recovered 390 ft. of oil with 50 ft. of oil-cut mud in 1 hour at 1 State-Lodestone, SW SW NW Lot 37, 56n-97w, Big Horn County. The well is slightly more than 1½ miles northwest of production in Byron field. Test was of the interval 6,165-77 ft. A later test at 6,180-6,253 ft. recovered water. Phillips is coring below 6,285 ft.

Phillips Petroleum Co. recovered oil on drill-stem test of the Tensleep at 1 State-Lodestone, Big Horn County wildcat, 1½ miles northwest of Byron field. There has been no previous drilling in the immediate vicinity.

Park County Wildcat Is Apparent Dakota Discovery

Mobil Producing Co. recovered apparently commercial quantities of oil on test of Dakota at T-61-12-P, NE NW NE 12-56n-100w, Park County. The well is the second test of the Bearcat Unit, and is 1 mile north of the previous well on the block, a failure at total depth of 10,128 ft. in Tensleep. Test was of the interval 7,940-95 ft.


There's a VIKING PUMP for every Job
Both LARGE
And SMALL
ABOVE:
A 1000 BPH FIELD GATHERING PUMP
AT LEFT:
A 50 GPM OIL CIRCULATING PUMP
From large field gathering pumps to small oil circulating pumps for treating crude, there's a Viking built in the size to fit the job.
Mounting, drive and power arrangements built to suit. All are positive, non-pulsating discharge pumps. Built for handling thin or viscous liquids.
Write for free folder 555t today.
VIKING
AN HONORED NAME IN PUMPING
See Our Catalog in SWEET'S
VIKING PUMP COMPANY
CEDAR FALLS, IOWA

and tool was open 1 hour. Recovery also included 420 ft. of heavily oil-cut mud. Flowing pressure at the end of the test was 850 psi.

Mobil is reported coring below 8,176 ft. with top of Dakota called at 7,940 ft. The wildcat will continue to the announced Tensleep objective at about 9,800 ft.

Meyer Gulch Discovery Completed

Superior Oil Co. reported a pump gage of 100 bbl. of oil per day at completion of 1 Government-Chittim, C SW SW 29-47n-90w, Washakie County. The well produces from Phosphoria at 8,800-32 ft. It is 4 miles southeast of Cottonwood Creek, where production is also from Phosphoria.

Goshen County Confirmation Near Completion

The Chicago Corp. and Republic Natural Gas Co. have run production string at 1 Van Mark, C NE NW 4-23n-61w, Goshen County. The well is an attempted confirmation of the recent Torrington field, which is the county's first production. Drill-stem test in "J" sand at 6,966-7,000 ft. recovered 30 ft. of mud-cut oil, 630 ft. of oil and gas-cut mud with 90 ft. of heavily oil and gas-cut water. Tool was open 2 hours, with flowing pressure 415 psi. at the end of the test. The Torrington field discovery was completed for 68 bbl. of oil per day on pump.

COLORADO

Gas Discovery Tested In Baca County

Moran Brothers, Inc. reported flow of gas at the rate of 1,000,000 cu. ft. per day on test of 1 Holt, NE NE NE 21-34s-41w, Baca County. The operators perforated and acidized the zone 2,834-46 ft. No tops have been reported. The wildcat is 10 miles south of Greenwood gas field and 15 miles west of Hugoton.

The Chicago Corp.-Republic Natural Gas Corp. 1 Van Mark, indicated ¼-mile southwest extension to Torrington Airport field in Goshen County, recovered oil shows in the Dakota "J" sand.

MONTANA

New Powder River Gas Discovery Rumored

El Paso Natural Gas Co. and George J. Greer, Trustee are reported to have set pipe on a wildcat in Powder River County following blowout. The well is 4 NP, C SE SE 21-1n-49e, 6 miles north of an earlier gas discovery by Greer. Operators have neither confirmed nor denied reports of a discovery.

The rumored discovery is one of a series of 20-25 wells to be drilled in this area of the state during 1955 by these operators. El Paso and Greer have released location for a 3,000-ft. Shannon test in this series in Custer County. It is No. 1 NP, SE SE SE 19-4n-45e, in the Sunshine Area of Custer County.

UTAH

Desert Creek Area Development Continues

Shell Oil Co. has made location for the fourth well in the Desert Creek area, San Juan County. The well is 3 Desert Creek, SW SE 25-41s-23e. The operator's first well in this area was a failure. The second was a Pennsylvanian discovery, and the third is nearing apparently successful completion. It is 26-23 Desert Creek, SE NW SW 36-41s-21e. A swab recovery at the rate of 197 bbl. of fluid per day has been reported.

WESTERN CANADA

ALBERTA

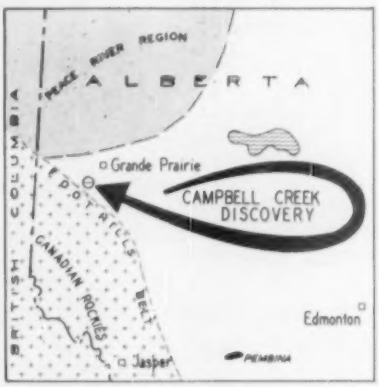
Erskine Area Step-Out Finds D3 Devonian Reef Oil

A step-out venture in the Erskine area has discovered oil in D3 Devonian reef. The new oil discovery is being drilled by Canadian Gulf Oil Co., Texaco Exploration Co., The British American Oil Co., McColl-Frontenac Oil Co., Ltd., and New Superior Oils of Canada, Ltd., on a unitized section of land on LSD 7, 19-39-20w4. This well also flowed gas from the top part of the reef.

The well, Gulf 7 Times, about 7 miles northwest of Stettler and 1½ miles northeast of Erskine field D3 Devonian wells, flowed 42 bbl. of oil through various size chokes on test at 5,385-95 ft. A test at 5,365-85 ft. flowed more than 9,000 M.c.f. of gas per day. The hole is at 5,395 ft. and crew is running logs.

Details Released on Gas Strike at Campbell Creek

The Foothills Belt has a new gas discovery. It is Anglo et al 35-11 Campbell, 17 miles southwest of Grande Prairie and 235 miles northwest of Edmonton.



Northwestern Alberta has a Cretaceous sand gas discovery at Campbell Creek.

The well flowed gas at the estimated rate of 7,000 M.c.f. per day with the Falker sand at 6,165-6,221 ft.

Success Scored at Offset To Sundre Oil Discovery

Hudson's Bay Oil & Gas Co., Ltd., has scored at its follow-up driller to the Sundre oil discovery well in south-central Alberta. The well, which entered the Mississippian pay zone about

(Continued on page 175)

Successful Wildcats

SOUTHWEST TEXAS

Brooks County: Hawn Brothers 4 Mestena, Block 11, La Mestena y Gonzalena Grant, A-480. IP 5,250 M.c.f. daily, open-flow potential, GCR 66.6 M.c.f. per barrel, 55°, perforations 4,962-76 ft. TD 6,661 ft. (New field—Gonzalena.)

Hawn Brothers 5 Mestena, Share 11, La Mestena y Gonzalena Grant, A-480. IP 153 BOPD, 5/32-in., 45.8°, perforations 6,560-64 ft., and 114 BOPD, 3/16-in., 46.4?, perforations 5,854-59 ft. and 5,862-67 ft. TD 7,500 ft. (New oil pays in Gonzalena field.)

Frio County: Sutton Drilling Co. 1 Stacey, Paul Isinghauer Sur., A-399. IPP 8.73 BOPD (net), 92 per cent water, 36°, open hole 4,291-4,310 ft. TD 4,310 ft. (New field.)

TEXAS GULF COAST

Aransas County: Heep Oil Corp. et al 2 Sellers, Lucas Subd. 2, John G. Smith

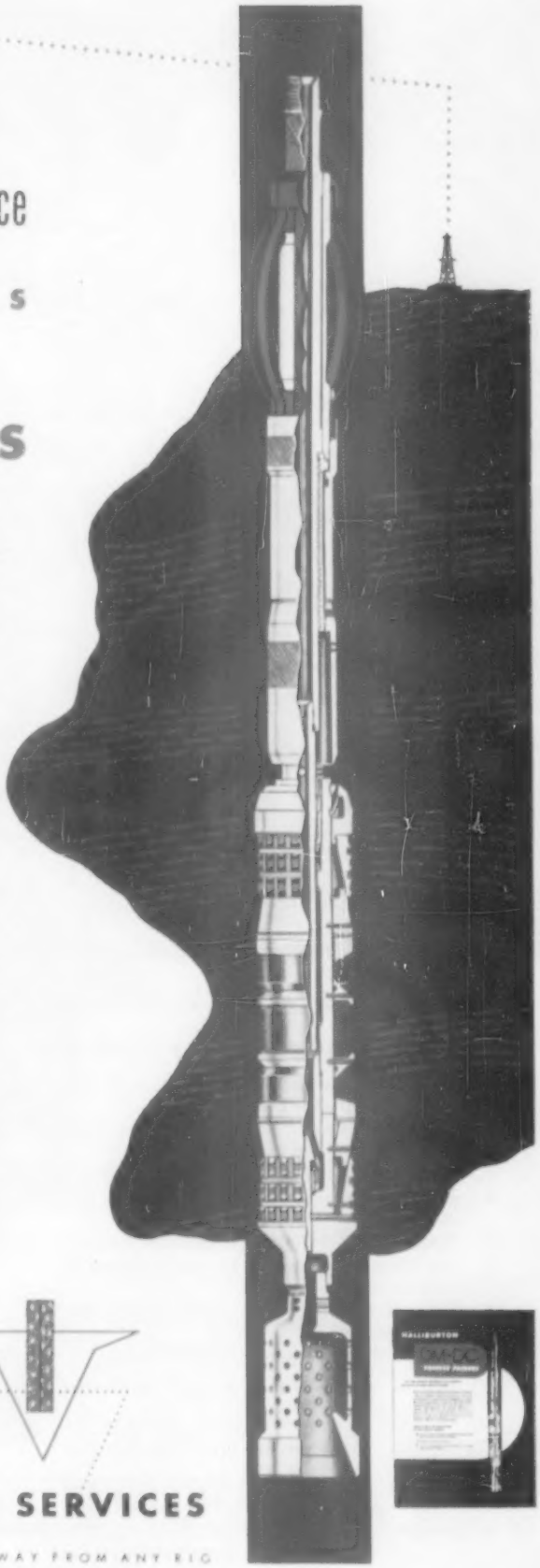
HIGHER STRENGTH
for deep hole service

HALLIBURTON'S
DM AND DC
SQUEEZE PACKERS

Here's the perfect pair of squeezing and bridging tools that were redesigned to handle deep hole work with greater safety and control. Halliburton's DM and DC Squeeze Packers now have an exclusive new design that increases packer's sealing strength in casing, reduces the swabbing action and *still* provides the proved operating features that set field records for dependable service.

Halliburton researchers added to the sealing strength of the Packers with a new internal seal, a stabilized center packer and a harder, higher strength material for end packers. When used as a bridge plug for temporary or permanent service, the packing elements and internal slips are designed for pressures in excess of 10,000 p.s.i.—when used for squeezing, the DM and DC Packers will withstand any pressures that tubing or casing can safely handle! And for both operations, positive mechanical action—rotation of tubing or pipe to the right and picking up—solidly sets the tool.

You will be interested in a new Halliburton bulletin that describes how these features and other improvements also permit faster running in with greater control. And you'll learn how the DM Packer—drillable magnesium for temporary bridging—and the DC Packer—drillable cast iron for permanent bridges—can make your operations safer, faster and more economical. For your free copy of the new bulletin and more help on all bridging and squeezing jobs, call your local or district office of the Halliburton Oil Well Cementing Company.



HALLIBURTON

CEMENTING SERVICES

211 SERVICE CENTERS – JUST MINUTES AWAY FROM ANY RIG

Sur., A-239. IP 19,000 M.c.f. daily, open-flow potential, GCR 40 M.c.f. per barrel, 53°, perforations 8,632-40 ft. TD 9,250 ft. (New pay in West Rockport field.)

Harris County: Lenoir M. Josey, Inc., 1 Howe, David White Sur. 98, A-879. IP 27,500 M.c.f. daily, open-flow potential, GCR 33.9 M.c.f. per barrel, 60.6°, perforations 7,963-68 ft. TD 8,100 ft. (New pay on east flank of Pierce Junction dome.)

Liberty County: Union Oil Co. of California 1 Murphy, GC&SF Sur. 25, A-464. IP 141 BSPD and 2,200 M.c.f. daily, adjustable choke, perforations 9,982-94 ft. TD 12,525 ft. (Extends, and new pay in Raymond field.

Victoria County: Seaboard Oil Co. 1 Pickering, J. M. Brownson Sur., A-370. IP 16,200 M.c.f. daily, open-flow potential, GCR 57.4 M.c.f. per barrel, 63.1°, perforations 6,164-69 ft. TD 6,300 ft. (New field, 2.3 miles south east of Placedo.)

TEXAS PANHANDLE

Hansford County: Cities Service Oil Co. 1 Brillhart "A," NE NE SW Block 45, Section 45, H&TC. IP 1,230 M.c.f. of gas per day, Douglas 5,298-5,310 ft. TD 7,722 ft. (Gas discovery).

WEST CENTRAL TEXAS

Callahan County: Sorrells Oil Co. 1 Scarborough, 146-2-GH&H, 4½ mil. SE Oplin. IP 287 BOPD, 28/64-in., 40°, TP 700 psi., GOR 4,400, Ellenburger 4,187-92 ft. TD 4,201 ft.

Eastland County: Panuco Oil Leases, Inc., et al 1 Walton, W. H. Sargent Sur., A-44, 3 mi. NE Desdemona. IPP 47.44 BOPD, 40°, GOR zero, Strawn sand 1,826 ft. TD 2,210 ft.

NORTH TEXAS

Archer County: J. W. Hastings 1 Petrex Oil Corp., Blk. 114, ATNCL Subd., 7 mi. NW Archer City. IPP BOPD, 39°, GOR zero, pay 1,252-60 ft. TD 1,302 ft.

Baylor County: G. C. Tisdale 1 Orsak, 5-1-D&W Sur., 2 miles SW Bomarton. IPP 25.4 BOPD, 36°, GOR 500, Tannehill sand 1,534 ft. TD 1,552 ft.

Clay County: Armour Properties 2 Scaling "4," Blk. 18, J. H. Belcher Subd., 4½ mi. SW Joy. IP 160 BOPD, 16/64-in., 41.5°, TP 100 psi., GOR 200, pay 4,515-25 ft. TD 4,062 ft.

LaGorce Oil Co. and Panhandle Oil Corp. 1 Threadgill, Sec. 3, Orange CSL Sur., A-368, 5 mi. S Henrietta. IP 216 BOPD, ⅛-in., 45°, GOR 650, TP 1,200 psi., Chappell limestone 6,247 ft. TD 6,257 ft.

Grayson County: Bridwell Oil Co. 1 Brown, W. H. Crow Sur., 5 mi. NW Sherman, A-309. IP 265 BOPD, 10/64-in., 36.5°, TP 1,250 psi., GOR 523, pay 9,479 ft. TD 9,604 ft.

Larton & Thomas 1 Craft, J. H. Clark Sur., A-273, 2 miles N Sherman. IP 335 BOPD, 18/64-in., 42°, GOR 1,875, TP 850 psi., pay 9,173-9,256 ft. TD 9,555 ft.

NORTHWEST NEW MEXICO

Rio Arriba County: Amerada Petroleum Corp. 1-B Jicarilla, NW SE NW 20-24n-5w. IP 1,629 M.c.f. of gas per day, Pictured Cliffs gas discovery, new field. TD 2,231 ft. Pictured Cliffs.

J. J. Harris 1 Jicarilla, NW SE NE 28-24n-5w. IP 3,848 M.c.f. of gas per day, Pictured Cliffs gas discovery, new field. TD 2,270 ft. Pictured Cliffs.

WEST TEXAS

Borden County: J. E. Jones & Co. 3 Miller, 12-33-T4N-T&P, 14 mi. SW Gail. IP 329 BOPD, 20/64-in., TP 270 psi., GOR 927, 39°, pay 7,126 ft. TD 8,800 ft.

J. Ray McDermott & Co. 1 Canon, 46-33-T5N-T&P, 15 mi. W Gail. IP 242.7 BOPD, 32/64-in., 39°, GOR 780, TP 180 psi., pay 7,419-45 ft. TD 8,467 ft.

Gaines County: Anderson-Prichard Oil Corp. 1 Webb, 20-C35-PSL, 6 mi. NW Seagraves. IP 607.5 BOPD, 7 per cent water, 30/64-in., TP 80 psi., GOR 10, 36.5°, top Devonian 13,024 ft., pay 13,028 ft. TD 13,133 ft., elev. 3,438 ft.

Humble Oil & Refining Co. 1-B Riley, 259-G-WTRR Sur., 7 mi. SW Seminole. IP 382-8 BOPD, no water, ½-in., TP 20 psi., GOR 7,35.4°, top Devonian 11,502 ft., pay 11,502 ft. TD 11,633 ft., ground elev. 3,350 ft.

Richardson & Bass 1 O'Daniel, 5-C44-PSL, 6 mi. Seminole. IPP 163.68 BOPD, 4 per cent water, GOR 128, 30.3°, top Strawn pay 9,758 ft. TD 11,344 ft., elev. 3,230 ft.

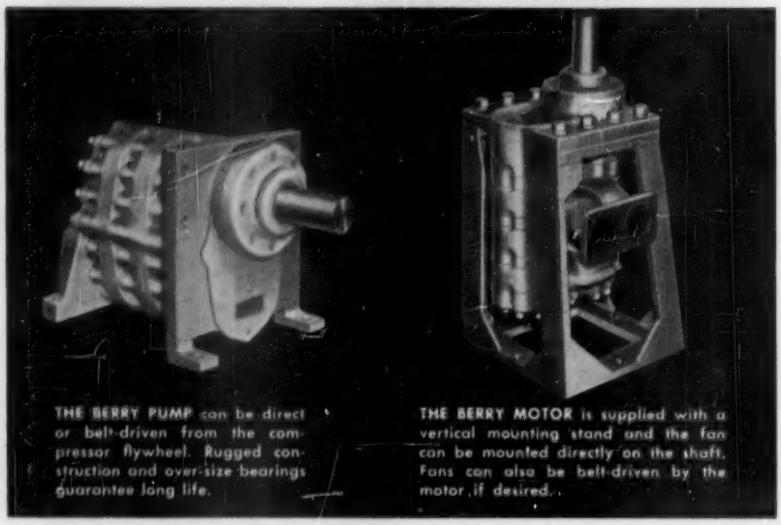
Midland County: Gulf Oil Corp. 1-L Scharbauer Cattle Co., 3-39-T1S-T&P, 6 mi. N Midland. IPP 59 BOPD, 57 per cent water, 49.8°, GOR 1014, top Ellenburger 12,714 ft., pay 12,720 ft. TD 13,098 ft., elev. 2,829 ft.

Pecos County: Standard Oil Co. of Texas 1 Canon, 19-C3-EL&RR Sur., 12 mi. SW Iraan. IP 517 BOPD, 23 per cent water, 18/64-in., TP 1075 psi., GOR 1180, 40°, top Ellenburger 9,544 ft., pay 9,800 ft. TD 9,846 ft., elev. 2,641 ft.

Runnels County: T. W. Murray 1 Bredmeyer, 63-73-HT&B Sur., 5 mi. NW Winters. IP 124 BOPD, 18/64-in., TP 110 psi., GOR 390, 42°, pay 3,814 ft. TD 4,662 ft.

Sutton County: Superior Oil Co. 1-13 Meckel, Sec. 13, GC&SF Sur., 4 mi. N Sonora.

BERRY® Hydraulic Drives for AERIAL COOLER FANS



THE BERRY PUMP can be direct or belt-driven from the compressor flywheel. Rugged construction and over-size bearings guarantee long life.

THE BERRY MOTOR is supplied with a vertical mounting stand and the fan can be mounted directly on the shaft. Fans can also be belt-driven by the motor, if desired.

Here's why leading utility companies choose Berry Hydraulic Drives:

1. Water temperature held to plus or minus one degree with infinitely variable fan speed.
2. One Berry Pump can drive four Berry Motors, for cooling-water, oil, gas and driving an auxiliary.
3. Safe; no hazardous sparking with hydraulic drives.
4. Low original cost of equipment; no gear-boxes or electrical circuits.
5. Flexibility of installation through simplicity of design.
6. For unattended service, Berry Drives can be fully automatic.
7. Drive is integrated with compressor for ease of relocation.
8. Hydraulic operation saves power costs.

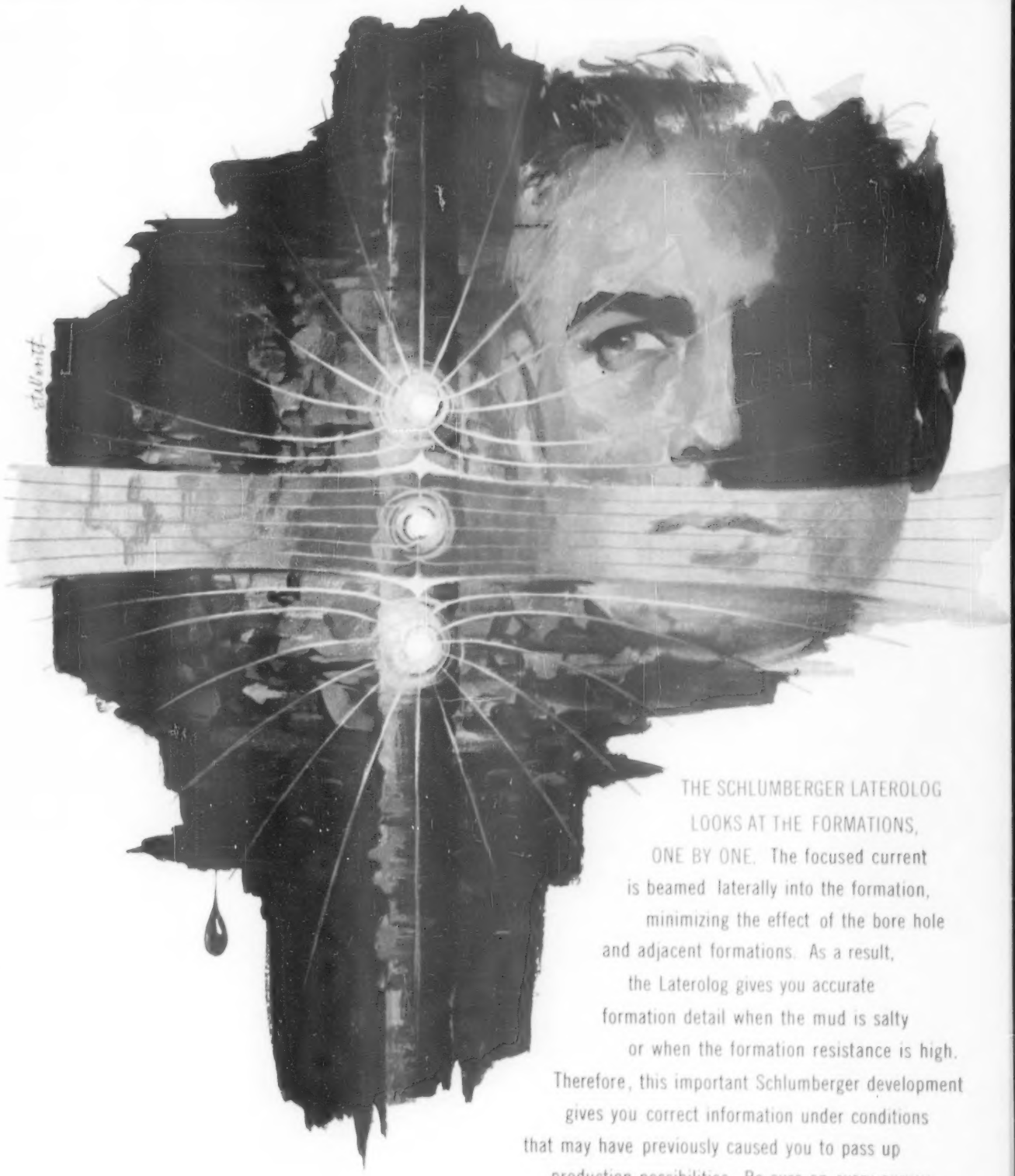
Write for locations of Berry Fan Drive Installations

WRITE for your copy of Bulletin FD-1 giving all data on selection and advantages of Berry Drives for Aerial Cooler Fans.

BERRY DIVISION

OLIVER IRON AND STEEL CORPORATION

PITTSBURGH 22, PENNSYLVANIA



THE SCHLUMBERGER LATEROLOG LOOKS AT THE FORMATIONS, ONE BY ONE. The focused current is beamed laterally into the formation, minimizing the effect of the bore hole and adjacent formations. As a result, the Laterolog gives you accurate formation detail when the mud is salty or when the formation resistance is high. Therefore, this important Schlumberger development gives you correct information under conditions that may have previously caused you to pass up production possibilities. Be sure on every survey.

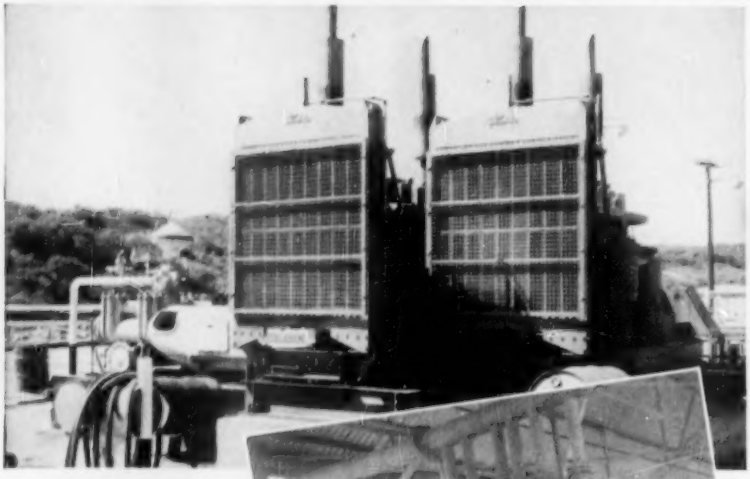
THE EYES OF THE OIL INDUSTRY

SCHLUMBERGER

Well Surveying Corporation

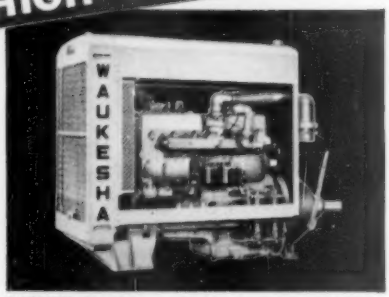
the Profitable Pipeline Power

WAUKESHA



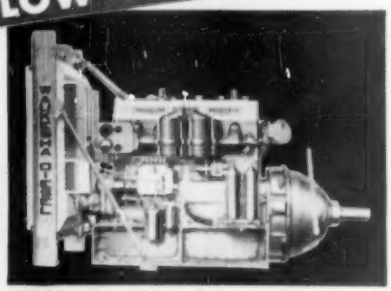
ENGINES and POWER UNITS 10 hp. to 1135 hp.

HIGH OUTPUT



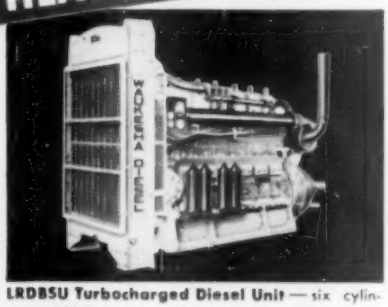
WAKBU Gas Power Unit—six cylinders, 6¼-in. bore x 6½-in. stroke, 1197 cu. in. displacement, 250 hp at 1800 rpm on natural gas.

LOW UPKEEP



NKDBU Normal Diesel Power Unit — six cylinders, 7-in. bore x 8¼-in. stroke, 1905 cu. in. displacement, 274 hp at 1200 rpm, maximum.

HEAVY DUTY



LRDBSU Turbocharged Diesel Unit — six cylinders, 8½-in. bore x 8½-in. stroke, 2894 cu. in. displacement, 526 hp at 1200 rpm, maximum.

Send for

BULLETIN 1079

It gives complete line of Waukesha Oil Field Engines for gas, gasoline, normal Diesel, or turbocharged Diesel operation—to 1135 hp.

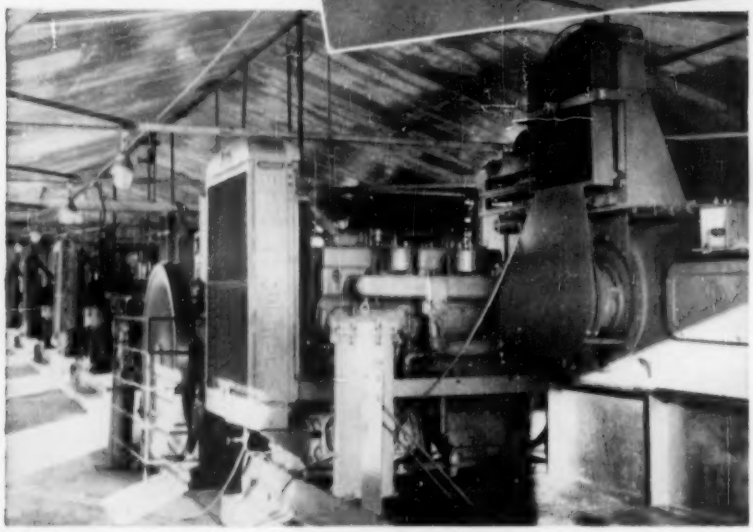
•

WAUKESHA MOTOR COMPANY

WAUKESHA, WISCONSIN

New York • Tulsa

251-R Los Angeles



IP 1,600 M.c.f., shut-in TP 1,760 psi., pay 5,560 ft. TD 5,905 ft.

KENTUCKY

Christian County: Adams Bros. Petroleum Co. 1 Higgins, SE SW NW 12-G-26. IP 1,250 M.c.f. of gas per day, Benoist 908-925 ft. TD 1,173 ft. (Opens Judges Chapel field.)

R. Croft Trustees 1 Wells, NE SW SE 12-G-26. IP 2,500 M.c.f. of gas per day, Benoist 916-25 ft. TD 926 ft. (Extension to Judges Chapel field).

MICHIGAN

Ottawa County: Miller Bros. 1 Brummel-Morren Comm., NW NW SE 28-5n-14w. IPP 15 BOPD, Traverse lime 1,556 ft. TD 1,558 ft. (Extends Zeeland "28" pool.)

WEST VIRGINIA

Jackson County, Grant district: B. H. Putnam 1 H. C. Milhoan, 1,000,000 cu. ft. gas, Corniferous lime 4,173 ft., gas 4,274-77 ft. TD 4,307 ft.

MISSISSIPPI

Adams County: Calto Oil Co. et al 1-Y Armstrong, 25-7n-1w. IPP 87 BOPD (net), 8 per cent water, 39°, Wilcox 5,816-18 ft. (perforations). TD 6,167 ft. (New field—Moss Grove.)

SOUTH LOUISIANA

Beauregard Parish: Houston Oil Co. of Texas 1 Lutcher-Moore, 16-5s-11w. IP 123 BOPD, ¼-in., 41.6°, perforations 7,595-7,600 ft. TD 8,217 ft. (New field.)

Lafourche Parish: Tide Water Associated Oil Co. 3 Delta, 35-17s-18e. IP 3,100 M.c.f. daily, spray distillate, 7/32-in., 38.7°, perforations 11,850-11,900 ft. TD 12,002 ft. (New pay in North Bourg field.)

Plaquemines Parish: California Co. 1 State Lease 2553, Block 41, South Pass Area, Gulf of Mexico. IP 238 BOPD, 9/64-in., 34.7°, perforations 10,096-10,108 ft. TD 13,972 ft. (New field.)

The Texas Co. 1 State Lease 2474, Township 23s-31e. IP 129 BOPD, X-27 choke, 29°, perforations 8,798-8,814 ft. TD 10,-004 ft. (New field—Joseph Bayou.)

F. A. Callery, Inc., 1 Harvey, 50-20s-30e. IP 94.08 BCPD and 5,741 M.c.f. daily, 17/64-in., perforations 10,794-10,824 ft. TD 14,149 ft. (New field—Fort Jackson.)

St. Martin Parish: Shell Oil Co. 1-A Schwing, 25-13s-11e. IP 27 BCPD and 1,970 Mc.f. daily, 9/64-in., 47.6°, perforations 11,848-63 ft. TD 12,158 ft. (New field.)

St. Mary Parish: Shell Oil Co. 1 Caffery et al, 24-15s-72 (north flank Cote Blanche dome). IP 33 BCPD and 1,800 M.c.f. daily, various chokes, 41°, perforations 16,410-15 ft. TD 16,479 ft. (New pay and extension Cote Blanche Island field —drilled approximately 12,000 ft. to salt overhang.)

ARKANSAS

Union County: E. D. Markham 1 Decimus Cates, C SW SE SW 33-18s-14w, 1⅜ miles west of South Hibank field. IPP 15 BOPD, Nacatoch sand 2,130-40 ft., 32°. TD 2,272 ft. (Discovery of Pleasant Grove field).

OKLAHOMA

Beaver County: Lion Oil Co. 1 Hodges, C SW NE 21-6n-24eCM. IP 4,500 M.c.f. of gas per day, Council Grove-Permian 3,102-3,315 ft. TD 6,535 ft. (Permian gas discovery).

KANSAS

Pawnee County: Anschutz Drilling Co. 1 Schartz, SE SE SE 14-22s-16w. IP 3,690 M.c.f. of gas per day, Arbuckle 4,043½-45½ ft. TD 4,063 ft. (Gas discovery).

CALIFORNIA

Ventura County: A. D. Rushing 1 J. V. Newman, SW SW 29-4n-23w, IPP 15 BOPD, 35° gravity, perfs. 1,513-76 ft. in Vaqueros sand, TD 1,576 ft. (New field in Oakview area north of Ventura.)

R. S. Lytle, Operator 1-A Williams, NE NE 33-3n-19w, IPF 50 BOPD, 25° gravity, ¼-in. choke, 600 psi. flow pressure, perfs. 4,250-4,381 ft., OWRD, old TD 8,500 ft., redrilled TD 4,381 ft. (New fault-block field near Moorpark.)

WYOMING

Washakie County: Superior Oil Co. 1 Government-Chittim, C SW SW 29-47n-90w. IPP 100 BOPD, Phosphoria discovery, new field. TD 9,073 ft. Phosphoria.

COLORADO

Morgan County, Mosley: Frank Humphries and Earl F. Siler 1 Muir, C NE SW 9-3n-57w. IP est., 5,000 M.c.f. of gas per day, "D" sand discovery, new field. TD 5,525 ft. "J" sand.

Washington County, Hyde: J. M. Thomson Drilling Co. and Leon Oliver, Jr. et al 1 Warren, SW SW NW 11-2n-49w. IPP 100 BOPD, "D" sand discovery, new field. TD 3,956 ft. "J" sand.

Weld County: M. J. Lebsack 1 Wahl, C NE SW 28-2n-61w. IP 7,850 M.c.f. of gas per day, "J" sand discovery, new field. TD 6,812 ft. Skull Creek.

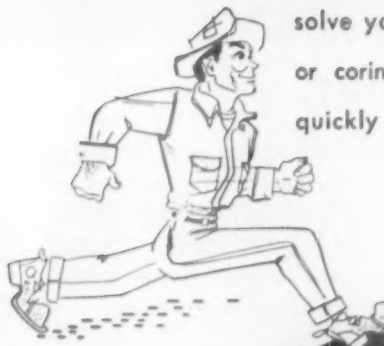
NORTHWEST TERRITORIES

Briggs 1 Rabbit Lake, 60 degrees 56 minutes North Latitude, 118 degrees 47 minutes West Long. Devonian lime gas well. TD 2,600 ft.

What's Doing at D & S?

we're busy giving Service

With a world-wide staff of engineers qualified to help solve your drilling or coring problems quickly and at the least cost.



DRILLING & SERVICE
3021 Elm Street
Dallas 1, Texas

TRUCO DIAMOND BITS AND D & S CORE BARRELS

Say, isn't that our pipe?"

BP TAKES THE LOAD

WHEREVER A TRUCK may be in Britain or in Europe, it is never very far from the familiar green and yellow BP Shield.

Fourteen BP refineries in eight countries produce high-grade fuels and lubricants for diesel vehicles. They help to keep the wheels of transport turning in countries as far apart as Iceland and Australia.

The BP Shield is a symbol of service all over the world. Behind it are all the resources of one of the largest and most progressive companies in the world petroleum industry.

The BP Shield is the symbol of the world-wide organisation of

The British Petroleum Company Limited

Von Hagen Elected

Lawyer is new president of Oil Producers Agency

RICHARD R. VON HAGEN, new president of Oil Producers Agency of California, is a former practicing attorney.

Von Hagen is president of one of California's most aggressive independent oil companies—Lloyd Corp., Ltd., with headquarters at Beverly Hills. Although a native of Minnesota, he is now as Californian as orange juice.

After going west, Von Hagen enrolled in the University of California at Los Angeles, where he received his bachelor of arts degree in 1931. From there, he went to the University of Southern California where he received his law degree 3 years later.

Von Hagen was associated with a California law firm for 4 years. He quit in 1938 to join Lloyd Corp. as vice president, a position he held until September 1953 when he moved up to president.

Dual role . . . Although most of his activities are centered in the oil business, Von Hagen keeps abreast of legal affairs. He is a member of the Los Angeles Bar Association and the State Bar of California.

His legal background makes him ideally suited to direct the activities of the Oil Producers Agency, a group of independent oil men operating in California. Von Hagen recently was elected president of the organization to succeed R. A. Grant.

Von Hagen also is active in regional and national organizations representing independent oil producers. He is a director of Western Oil and Gas Association and of the Independent Petroleum Association of America. In addition, he is a member of the board of the U. S. National Bank of Portland, Ore.

The 44-year-old oil executive lives at Encino, Calif. He is married and has two children—Ronold Lloyd Von Hagen, 16, and Theresa Lloyd Von Hagen, 12.

Max E. Curry, former district petroleum engineer for Skelly Oil Co. at Hobbs, N. M., has resigned and joined Buffalo Oil Co. at Artesia, N. M., as a petroleum engineer.

Gordon T. Granger, former chief engineer and purchasing agent of Danaho Refining Co., Houston, has been named vice president in charge of manufacturing. **C. W. Curtis** was promoted at the same time from sales manager to vice president in charge of sales.

James B. Black, president of Pacific Gas & Electric Co. since 1935, has been named chairman of the board of directors effective June 1. **Norman R. Sutherland,** vice president and general manager, has been named president and general manager. **Robert H. Gerdes,** vice president and general counsel, has been promoted to executive vice president and general counsel.

C. B. Wentz has been promoted to assistant manager of Continental Oil Co.'s southern region, comprising Central and South Texas, parts of East Texas, Louisiana, southern Mississippi, and Alabama. Wentz joined Conoco at Ponca City, Okla., in 1938 and was promoted to proration engineer there in 1946. He was transferred to Houston as chief proration officer in 1950 and was promoted to manager of the headquarters coordinating and planning department in 1952.

John P. Peet has been promoted to senior research chemical engineer at the research and development division of Humble Oil & Refining Co.'s Baytown refinery. A graduate of Rice Institute, Peet joined Humble's research and development division when he finished Rice in 1948.

W. S. Crake, former chief mechanical engineer for Shell Oil Co.'s Houston area, has been promoted to area production superintendent. A veteran of 28 years with Shell, Crake has held engineering posts with the company in Texas, New Mexico, Arkansas, Louisiana, and Trinidad. Crake will be replaced as chief mechanical engineer by **J. R. McEntee,** who has been chief development engineer on the staff of the technical services division. McEntee joined Shell in California in 1936 and was first sent to Houston in 1951 as senior mechanical engineer.

P. W. CORNELL

P. W. Cornell, a director of Goodrich-Gulf Chemicals, Inc., since 1953, has been elected vice president in charge of operations, engineering, and development. In order to accept his new position, Cornell has resigned as assistant manager of the chemical department of Gulf Oil Corp. **J. E. Miller** has been named sales manager for the firm.

Robert C. Erickson, development geologist with Standard Oil Co. of California, has been transferred from Coalinga to Oxnard, Calif. **Hy Seiden** has been named to replace Erickson at Coalinga.

Doy V. Whitlock, former petroleum engineer with Far West Oil Co. at Glenrock, Wyo., has been transferred to Midland, Tex., as petroleum engineer for the Odessa area of Tennessee Gas Transmission Co.

John L. Townley, III, district geologist for Socony-Vacuum Oil Co. of Canada, Ltd., at Swift Current, Sask., since February 1953, has been promoted to coordinator of development drilling at Calgary. **R. L. (Dick) Slavin,** assistant district geologist at Swift Current, has been promoted to district geologist there.

John M. Sprague, Mattoon, Ill., has been elected a vice president of Carter Oil Co., effective May 1. Sprague had been serving as manager of Carter's eastern division operations in Illinois, Indiana, Michigan, and Kentucky the past 1½ years. Sprague, a veteran of 19 years with Carter, will be stationed in Tulsa. **R. C. Curtis,** production superintendent of the eastern division,

PERSONALS

will succeed Sprague as eastern division manager. Curtis began his service with Carter as an engineer in the production and research departments in 1937.

S. A. Swensrud, chairman of the board of Gulf Oil Corp., has been elected chairman of the board of Goodrich-Gulf Chemicals, Inc., a jointly owned company of Gulf and B. F. Goodrich Co.

M. W. Ramsey, former assistant general manager of operations of the pipeline department of Gulf Refining Co. at Houston, has been promoted to coordinator of product pipelines for Gulf Oil Corp. Ramsey will headquarter at Pittsburgh.

T. H. Philpott, former Shreveport area manager, has been promoted to exploration manager by Olin Oil &

T. H. PHILPOTT

E. C. BRIMBERRY

Gas Corp. and Olin Gas Transmission Corp. Philpott, formerly with Carter Oil Co., joined the Olin companies in 1953. **Earl C. Brimberry,** veteran of 28 years with Olin and its predecessor, Interstate Gas Co., was named manager of the production department. **Arthur H. Trowbridge,** former area geologist at Shreveport, was named acting area exploration manager at Shreveport.

Joseph P. Chamberlain, former chief engineer with Derby Oil Co. at Wichita, has resigned and is now chief engineer for Delta Refining Co. at Memphis.

F. M. Watkins, Sinclair Research Laboratories, Inc., of Harvey, Ill., has been retained by the division of transportation of the American Petroleum Institute, to coordinate research on tanker corrosion problems.

Harold J. Maddock has been promoted to chief technologist by Tide Water Associated Oil Co.'s Avon, Calif., refinery. Maddock joined Tide Water as a laboratory chemist in 1943. **James F. Dehnert** has been named assistant chief technologist replacing Maddock.

Rocky Mountain A.P.I. Group Officers

R. M. Churchill, division engineer for Ohio Oil Co. at Casper, Wyo., was elected chairman of the Rocky Mountain district of the American Petroleum Institute's division of production at a recent meeting in Casper. Churchill and L. S. Fuller, El Paso Natural Gas Co., Salt Lake City, vice chairman for Utah, were unable to be in the picture. Other officers elected were, left to right, George Goodin, Petroleum Information, Casper, vice chairman for Wyoming; H. P. Gernert, Trigood Oil Co., Casper, retiring chairman; A. W. Thompson, A. W. Thompson, Inc., Houston, A.P.I. vice president of production; R. W. Gemmer, Carter Oil Co., Billings, vice chairman for Montana; R. A. Wright, Sinclair Oil & Gas Co., Denver, vice chairman for Colorado; R. G. Fuller, Amerada Petroleum Corp., Williston, vice chairman for North Dakota; Richard Armstrong, Oil Well Supply Co., Casper, secretary-treasurer; and R. E. McMillen, Ohio Oil Co., Sidney, vice chairman for Nebraska.

Ray H. Smith has joined Hewgley Drilling Co., Tulsa, as special representative. He formerly was with Simmons Drilling Co., Tulsa, and Magnet Cove Barium Corp.

Nick P. Peet has been promoted to senior technical specialist in the technical service by Humble Oil & Refining Co. at its Baytown, Tex., refinery. Peet joined Humble in 1941.

Dr. John D. Long, research and design engineer of Creole Petroleum Corp., has been named head of the manufacturing group in the company's New York office. Long joined the Jersey Group in 1936 with Esso Research & Engineering Co. as a process design engineer at Bayway, N. J. He joined Creole in 1945 as technical assistant to the company's refining manager in Venezuela. He was transferred from Venezuela to New York in 1949 as technical assistant to the then head of manufacturing.

C. R. Bickel has been named manager of Shell Oil Co.'s new production division headquarters in Regina, Sask. He was transferred from Shell's Midland, Tex., office. **G. A. A. Middleberg,** former district production superintendent at Regina, has been transferred to Calgary on special assignment. Other appointments in the new division include **R. K. Pettigrew,** division exploitation engineer; **E. G. Neillis,** division mechanical engineer; **G. R. T. Heaney,** division reservoir engineer; and **H. B. Grist,** division purchasing stores supervisor.

W. H. Fortney has been promoted to general shops foreman in maintenance and construction at the Baytown, Tex., refinery of Humble Oil & Refining Co. Before his promotion, Fortney had been serving as foreman of the instrument department. **J. Raymond Martin,** assistant instrument foreman, has been promoted to succeed Fortney.

W. L. Hooks, district superintendent of the Pollard district, Louisiana division of Humble Oil & Refining Co., has been named district superintendent of Livingston district, Gulf Coast division. Other Humble changes include **J. L. Hackney,** senior gas engineer, gas division office, transferred to Bayou Sale district, Louisiana division, as senior gas engineer; **J. T. Murff,** district civil engineer, Sugar Valley district, Gulf Coast division, transferred to Avery Island district, Louisiana division; **J. G. Jackson,** senior petroleum engineer, Southwest Texas division office, moved to Louisiana division office as senior petroleum engineer; and **M. E. Mitchell, Jr.,** district petroleum engineer, Winters district, North Texas division, promoted to assistant district superintendent at Eucutta district, Louisiana division.

PERSONALS

Norman H. Causey, former district production engineer with Atlantic Refining Co. at Tulsa, has been promoted to area reservoir engineer.

G. Y. McCOY

George Y. McCoy has been elected president of International Oil Corp., Dallas, replacing **E. E. Fogelson,** who takes over as chairman of the board of the company. McCoy has been a petroleum-engineering consultant in Dallas for the past 7 years. Before opening consulting offices, he was associated for 9 years with the oil-loan department of the Republic National Bank in Dallas and before this with the exploitation and reservoir-engineering departments of Shell Oil Co. and Skelly Oil Co. He was educated at Oklahoma A. & M. College, Colorado School of Mines, and University of Kansas.

J. K. Wetherill has been promoted to manager of the exploration department of Kewanee Oil Co.

Keegan Carter, reservoir geologist with Gulf Oil Corp., has been transferred to Houston from Shreveport, where was serving in a similar position with Gulf Refining Co.

William F. Styler, Jr., has been elected vice president and treasurer of Deep Rock Oil Corp. Styler has been with Deep Rock since 1949 and for the past year has served as controller.

Charles E. Paules, veteran petroleum engineer, has been named a vice president of Esso Research & Engineering Co. He succeeds Eric Luster, who died April 2. Paules has been with the company since 1919 and from 1949 to 1954 served as chief engineer.

W. L. Stanton, manager of the gas supply department of Texas Gas Transmission Corp., has been elected vice president in charge of gas supply for the firm. Stanton joined Texas Gas Transmission in 1949 as superintendent of gas supply. He was promoted to manager last year.

Hayden A. Glatte has been elected executive vice president and general manager of Inter-State Oil Co., of Kansas City.

Henry Kerr, production superintendent with Delhi-Taylor Oil Corp., has been transferred from McAllen, Tex., to Dallas.

C. D. Ball, general superintendent of the pipeline department of Standard Oil Co. of Calyifornia, has retired. **E. J. Hyde** has succeeded him.

Robert I. Dickey has been elected vice president, exploration, of Texas Pacific Coal & Oil Co. Dickey, former vice president at Midland, Tex., for Forest Oil Corp., joined Texas Pacific's exploration department April 1.

A. F. Barrett, Mobil Producing Co., Billings, Mont., and **George Goodin,** Petroleum Information, Casper, Wyo., recently received citations for service from the division of production of the A.P.I. **A. W. Thompson,** Houston, A.P.I. vice president for production, presented the awards. Walter L. McCloy, Jr., Sohio Petroleum Co., received a citation posthumously. Barrett was honored for his efforts as an officer of the Rocky Mountain district of the A.P.I. division of production. Goodin was cited for his efforts in informing oil men and the public about activities of the district. McCloy was honored for his leadership in drilling and production practice activities.

Jack A. Horner, former secretary of Shell Oil Co., has been appointed vice president in charge of the licensing division of Shell Development Co.

Wilton E. Scott, recently resigned vice president of Buffalo Oil Co., has been named manager of exploration in the production division of Tennessee Gas Transmission Co. Scott began his oil career in 1936 when he did surface geology for Standard Oil Co. (N. J.) in Venezuela until 1938. He later joined Cities Service Oil Co. and served with them for 6 years in Texas, Oklahoma, New Mexico, and the Rocky Mountain area. He joined Buffalo in 1944 as chief geologist.

DEATHS

E. L. Caster, veteran manager of the exploration division of Arkansas Fuel Oil Corp., died of a heart attack April 22. Carter, who joined Arkansas Fuel in 1929 as a production engineer, had just finished a round of golf when stricken. He was named manager of exploration for the company in 1932.

James G. Boyce, 74, vice president and treasurer of Nebo Oil Co., Inc., and vice president of the William Buchanan Foundation, died recently in Dallas.

William Henry Case, 78, retired division superintendent of Gulf Oil Corp., died April 23 at his home in Tulsa.

F. A. Gildemeister, Peruvian sugar producer and oil man, died at his home in Lima recently. He was 65.

Frank O. Patterson, 78, Kern County, California, oil operator, died recently at his home in North Hollywood, Calif.

Arthur Allen Robinson, 49, head of Standard-Vacuum Oil Co.'s New Delhi, India, office, died April 21.

Paul L. Meaders, independent operator of San Antonio, Tex., died at his home there recently after an illness of several months. He had oil interests in several states and was formerly associated with John J. Sherring, of San Antonio, one of the founders of La Gloria Corp. Meaders was a brother of L. B. Meaders, president of Halliburton Oil Well Cementing Co.

Mrs. Frances R. Curtis, 64, vice president of Empire State Oil Co., Thermopolis, Wyo., died April 22. Mrs. Curtis had been active in the oil business since the death of her husband, Heman D. Curtis, 11 years ago.

Dr. Fred S. Clinton, 81, prominent Tulsa physician and oil man, died April 25 after a 5-month illness. Clinton and a partner, J. C. W. Bland, drilled the first well in the district in 1901 at Red Fork, Okla.

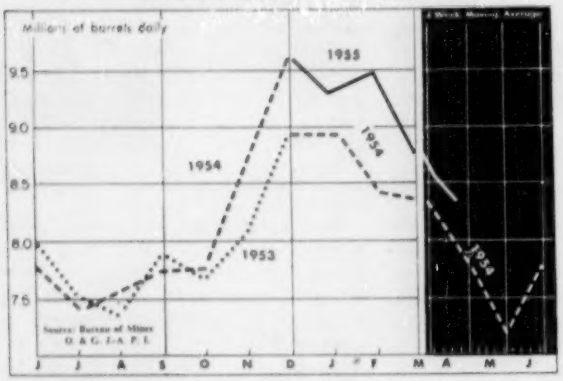
James L. Snedden, 84, retired oil man, died of a heart ailment in Tulsa after a long illness. A Tulsan for about 50 years, he worked for Inter-Ocean & Producers Oil Co. and was vice president of Arrow Drilling Co.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,837,050	UP	2,300	UP	194,715
Crude stocks	271,425,000	UP	2,374,000	UP	3,229,000
Completions	1,079	DOWN	27	UP	90
Refinery runs	7,099,000	DOWN	32,000	UP	287,000
Gasoline stocks	179,741,000	DOWN	2,123,000	UP	1,708,000
Distillate stocks	65,678,000	UP	2,318,000	UP	6,746,000
Four-product stocks	310,467,000	UP	1,051,000	UP	11,205,000
Total imports	1,027,300	DOWN	199,200	UP	5,300

TOTAL DEMAND—ALL OILS



May Will Be the Critical Month for Product Markets

REFINERS' programs for May can make or break product markets for the summer. Crude runs at refineries dropped sharply early in April but were climbing again near the end of the month.

Product stocks were considered satisfactory at the end of 1954. Demand in the first quarter of 1955 was up about 6 per cent over the same quarter of 1954, but increased consumption was more than offset by increased supply.

Stocks of the four major products decreased only 324,000 bbl. daily in the first 3½ months of this year compared with a reduction of 480,000 bbl. daily for the same period last year. Refiners started this year with major product stocks 4 million barrels less than a year earlier. By the middle of April, they had lost not only the 4-million-barrel cushion but had manufactured enough of the four products to put stocks 12.6 million barrels ahead of last year. By the end of the month the surplus may be as much as 14 million over last year.

During May last year, refiners added 19 million barrels to major product stocks, enough to soften product prices by the middle of the year. Product markets probably could have withstood gains of 12 or 14 million barrels in May of last year.

Since major product stocks at the beginning of May will be about 14 million barrels more than last year, there seems to be little need for any big increase in May.

Total demand for crude and products in May is forecast at about 7,600,000 bbl. daily. About 1,100,000 bbl. daily of this demand will be supplied by product imports, natural-gas liquids, and crude for exports or transfers. If product stocks are not increased in May, total demand for the month could be met with refinery runs of 6,500,000 bbl. daily. Since runs are not expected to drop to an average of 6,500,000 bbl. daily, the difference will show up as product stock increases.

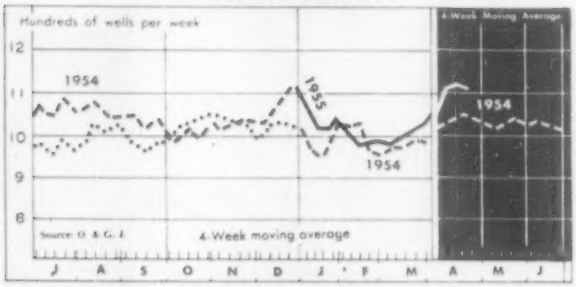
If May refinery runs average 6,900,000 bbl. daily, total product stocks will gain over 12 million barrels during the month. About 8 million of this increase can be expected in major products which will put total major product inventories above last year.

This comparison indicates a need for a reduction in refinery runs to at least 6,800,000 bbl. daily in May unless current figures show that demand for the month will average more than 7,600,000 bbl. daily. Part of the pressure for higher runs in May will come from excessive crude supply.

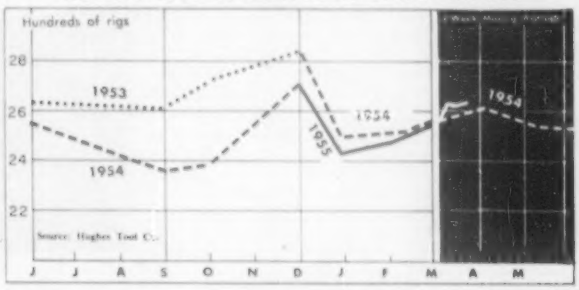
Crude production and crude imports for May will supply about 7,270,000 bbl. daily above requirements for crude exports, transfers, and losses. The excess over refinery runs will be added to crude storage. Crude stocks will reach 275 million barrels by the first of May.

Group 3 gasoline has gained strength over the past week. Spot prices are up about 0.5 cent a gallon to the level of early 1954. Light heating oils are off on both East Coast and Gulf Coast markets. Marketers announced an allowance of 0.3 cent for many areas of the East Coast. Light fuels on the Gulf Coast are off 0.25 cent.

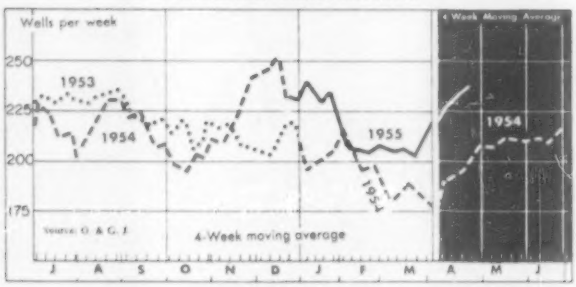
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	4-25-55	Change from 4-18-55	Change from 4-26-54
Gulf Coast	581	—6	12
N. and W. Texas-New Mexico	861	1	59
Arkansas-N. Louisiana-E. Texas	162	—8	—24
Oklahoma	320	—4	—46
Kansas-S. Nebraska	191	11	38
Illinois-Eastern	152	20	10
Rocky Mountain	202	—5	—59
Pacific Coast	157	2	16
Total United States	2,626	11	6
Western Canada	105	—13	—36

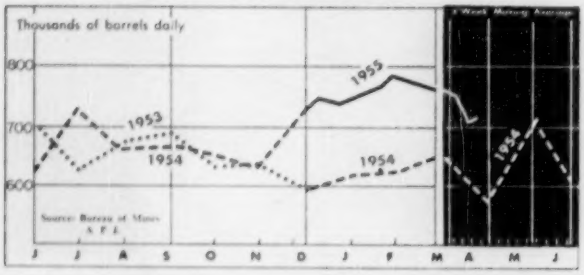
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 23, 1955

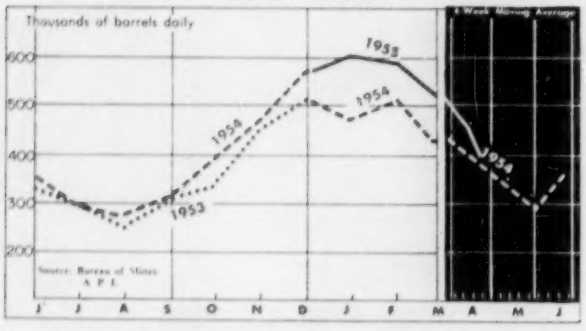
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	6,750	33	38	0	0	0	1	1	0	0	0	32	32
Arkansas	16	9	0	7	52,019	201	191	2	0	0	4	6	12	0	0	54	66
California	52	40	0	12	258,865	781	771	2	0	0	7	9	12	0	2	109	123
Colorado	41	6	3	32	223,077	395	364	1	0	2	26	29	13	0	10	203	226
Illinois	68	33	1	34	156,176	1,096	791	1	0	1	25	27	19	0	1	171	191
Indiana	11	3	1	7	15,813	218	258	1	0	0	3	4	5	0	0	94	99
Kansas	106	51	8	*47	374,614	1,536	1,334	0	0	1	13	14	40	1	10	234	285
Kentucky	25	7	9	9	42,900	373	327	0	0	2	3	5	12	0	4	59	75
Louisiana	85	56	5	24	661,727	1,166	961	3	4	0	7	14	37	28	9	111	185
North	26	19	3	4	72,924	593	498	0	0	0	0	0	5	3	1	43	52
South	59	37	2	20	588,803	573	463	3	4	0	7	14	32	25	8	68	133
Michigan	11	7	0	4	25,675	158	173	1	0	0	2	3	4	0	0	61	65
Mississippi	4	3	0	1	27,907	135	112	1	0	0	0	1	3	0	0	48	51
Montana	2	0	0	2	5,996	95	82	0	0	0	1	1	1	0	1	28	30
Nebraska	9	4	1	4	51,006	190	106	0	0	0	0	0	14	0	0	77	91
New Mexico	30	15	7	8	133,146	397	362	0	0	2	5	7	14	1	3	31	49
Northwest	12	0	7	5	39,911	99	116	0	0	2	3	5	1	0	3	8	12
Southeast	18	15	0	3	93,235	298	246	0	0	0	2	2	13	1	0	23	37
North Dakota	7	5	0	2	53,756	66	68	0	0	0	1	1	0	0	0	11	11
Ohio	17	5	5	7	37,002	314	343	0	0	0	2	2	1	0	2	9	12
Oklahoma	163	103	6	*54	546,860	2,621	2,833	2	0	1	12	15	42	7	14	193	256
Pennsylvania-New York	22	9	6	7	47,104	466	754	0	0	0	0	0	0	0	5	3	8
Texas	389	250	24	115	1,796,078	5,980	5,497	18	5	4	78	105	236	31	43	1,246	1,556
Southwest (1 & 4)	76	44	2	30	294,737	964	770	2	2	0	20	24	34	9	15	240	298
Gulf Coast (2 & 3)	56	32	6	18	322,142	803	813	0	3	2	9	14	28	19	16	196	259
East (5 & 6)	13	5	3	5	73,700	308	278	0	0	0	5	5	11	1	1	103	116
North Central (7-B & 9)	105	77	1	27	375,656	2,073	2,100	8	0	0	18	26	115	0	1	476	592
West (7-C & 8)	116	78	3	35	651,875	1,519	1,253	8	0	1	26	35	46	0	6	226	278
Panhandle (10)	23	14	9	0	77,968	313	283	0	0	1	0	1	2	2	4	5	13
Utah	0	0	0	0	0	19	22	0	0	0	0	0	2	0	2	12	16
West Virginia	6	1	5	0	15,807	180	175	0	0	1	0	1	0	0	3	8	11
Wyoming	10	9	0	1	45,304	241	469	1	0	0	0	1	6	0	3	45	54
Miscellaneous (Tenn., Mo.)	4	0	0	4	4,752	15	75	0	0	0	3	3	0	0	0	13	13
Total United States	**1,079**	616	81	382	4,582,334	16,676	16,106	33	9	14	193	**249**	473	68	112	2,852	3,505
Total previous week	1,106	640	48	418	4,305,732			37	6	5	184	232	440	59	98	2,659	3,256
Total April 24, 1954	989	559	58	372	3,770,610			24	2	7	178	211	428	48	102	2,664	3,242
Western Canada	33	16	1	16	153,322												

Service wells included: *1, †6.

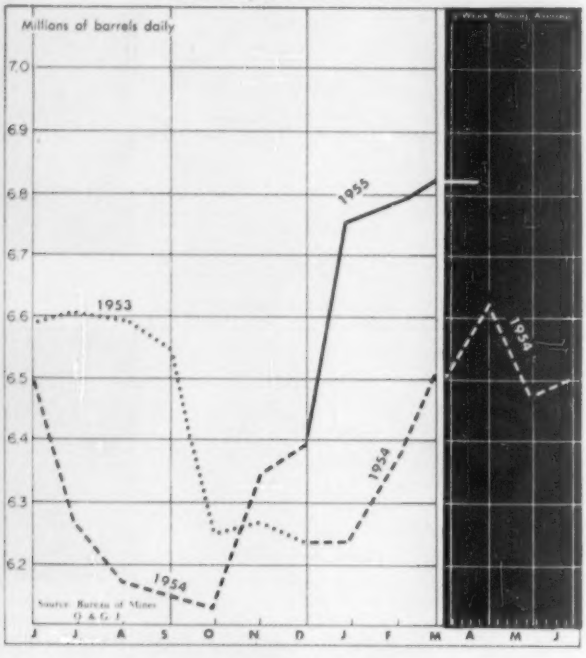
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

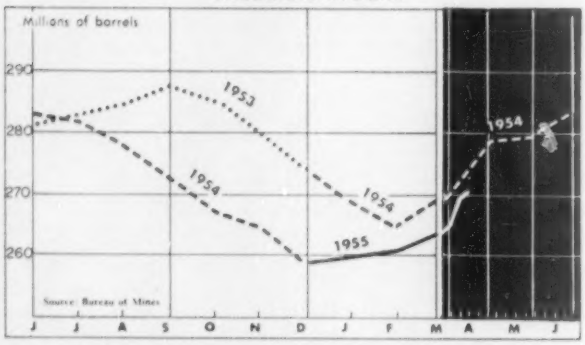


DAILY AVERAGE PRODUCTION FOR WEEK

	April 23			April 16
	Crude oil	Lease condensate	Total	total
Alabama	4,100		4,100	4,300
Arkansas	73,050	400	73,450	74,300
California	974,800		974,800	973,400
Colorado	139,800		139,800	139,100
Eastern	46,500		46,500	46,500
Florida	1,325		1,325	1,325
Illinois	219,000		219,000	216,000
Indiana	27,700		27,700	28,300
Kansas	329,600		329,600	327,100
Kentucky	38,400		38,400	38,600
Louisiana	667,950	54,250	722,200	721,950
North	110,950	2,900	113,850	113,600
South	557,000	51,350	608,350	608,350
Michigan	33,100		33,100	31,600
Mississippi	90,800	5,050	95,850	95,850
Montana	43,300		43,300	43,100
Nebraska	29,000		29,000	28,900
New Mexico	226,125	4,400	230,525	230,725
North Dakota	30,700		30,700	29,600
Oklahoma	562,700		562,700	570,100
Texas	2,893,400	50,500	2,943,900	2,943,900
Dist. 1	54,000	575	54,575	54,575
Dist. 2	150,700	8,100	158,800	158,800
Dist. 3	445,000	23,000	468,000	468,000
Dist. 4	244,000	5,500	249,500	249,500
Dist. 5	47,000	500	47,500	47,500
Dist. 6	124,800	5,400	130,200	130,200
East Texas field	231,200		231,200	231,200
Dist. 7-B	141,000	50	141,050	141,050
Dist. 7-C	195,000	4,500	199,500	199,500
Dist. 8	966,700	2,000	968,700	968,700
Dist. 9	207,000	750	207,750	207,750
Dist. 10	87,000	125	87,125	87,125
Utah	6,100		6,100	6,200
Wyoming	284,500		284,500	283,600
Others	‡500		‡500	‡300
Total U. S.	6,722,450	114,600	**6,837,050**	6,834,750
Change from previous week, up			**2,300**	
Canada	†291,175		†291,175	†277,500
Total U. S. production January 1-April 23			763,867,075 bbl.	
Same period last year (crude plus cond.)			*725,636,965 bbl.	

*Includes 11,764,825 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 400.

CRUDE-OIL STOCKS

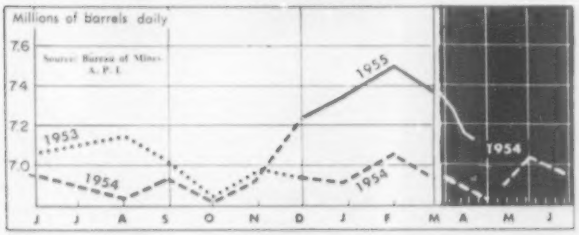


CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

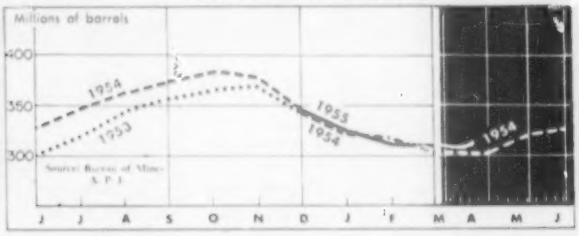
	Apr. 16, '55	Apr. 9, '55	Apr. 17, '54
Pennsylvania Grade	2,820	2,823	2,986
Other Appalachian	2,216	2,236	1,572
Illinois, Indiana, Michigan	10,814	10,707	12,099
Nebraska, North Dakota	2,374	2,105	(‡)
Kansas	8,591	8,395	9,530
Oklahoma	24,764	25,106	26,686
Arkansas	2,991	3,194	3,166
Louisiana	15,343	15,062	14,763
North	2,500	2,425	2,477
South	12,843	12,637	12,286
Mississippi	2,931	3,161	3,484
New Mexico	8,602	8,308	7,847
Texas	124,502	123,647	123,895
East Texas proper	10,167	10,002	10,764
West Texas	55,339	54,349	53,783
Texas Gulf	24,812	24,485	25,873
Other Texas	34,184	34,811	33,475
Wyoming	14,988	15,233	13,793
Other Rocky Mountain	5,663	5,364	3,797
California	32,527	32,796	34,408
Foreign	†12,299	10,914	10,170
Total	271,425	269,051	268,196

*Bureau of Mines. †Includes 2,977,000 bbl. in California. ‡Included with Kansas.

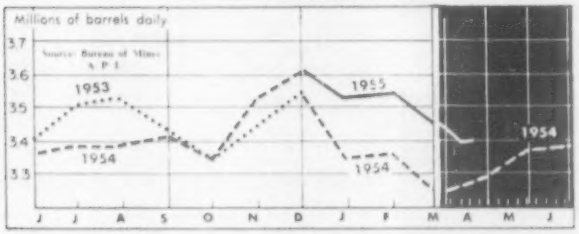
REFINERY RUNS



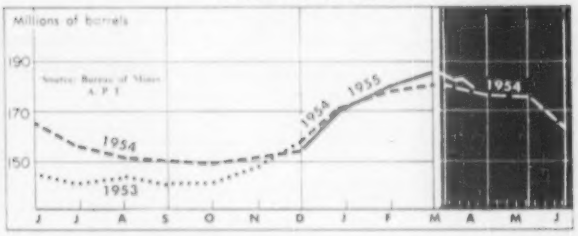
FOUR-PRODUCT STOCKS



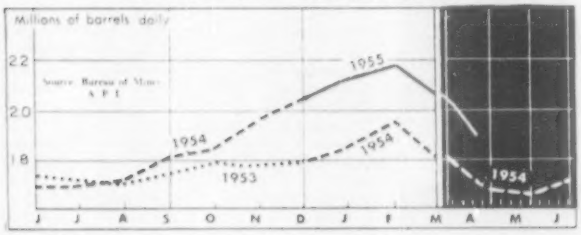
GASOLINE PRODUCTION



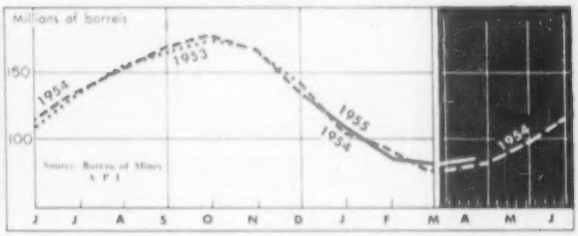
GASOLINE STOCKS



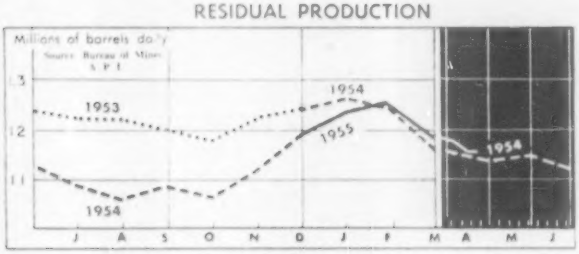
MIDDLE-DISTILLATE PRODUCTION



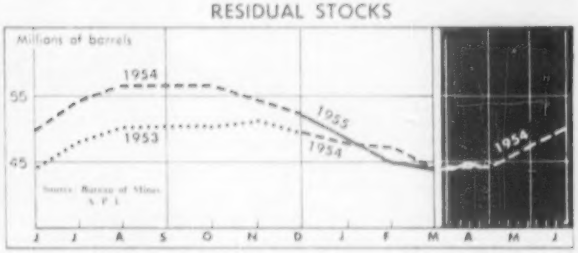
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 22

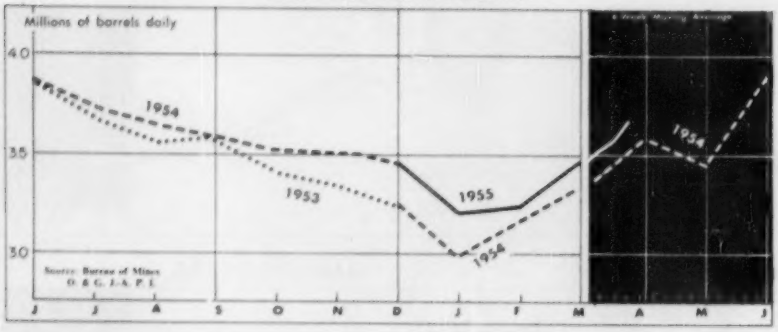
(Excludes all jet-fuel components)

(Thousands of barrels)

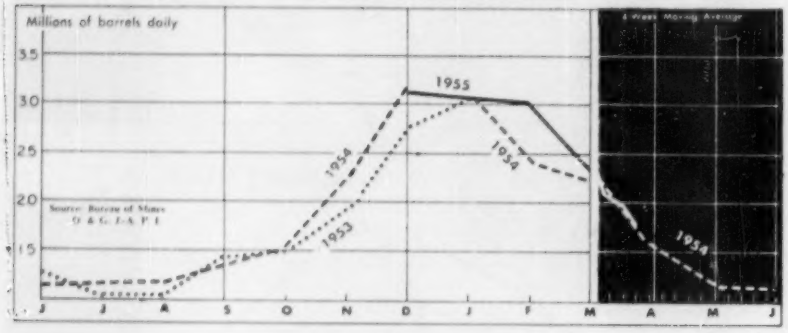
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1954—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	986	390.2	25.9	259.3	217.6	27,592	9,013	22,998	7,750	996	415.8	35.5	228.7	197.6
Appalachian:														
District 1	100	43.6	2.4	25.0	9.0	5,018	476	1,473	354	99	35.5	4.8	20.1	9.6
District 2	81	41.0	5.6	12.1	15.0	2,594	366	601	128	81	43.5	3.5	16.4	11.6
Ind., Ill., Ky.	1,250	663.0	64.6	207.8	144.6	38,379	4,217	10,327	3,312	1,243	654.3	75.4	218.1	163.2
Okla., Kans., Mo.	599	310.1	11.0	151.8	40.3	18,209	920	7,182	972	569	331.3	15.1	125.6	42.3
Inland Texas	257	177.0	12.7	35.3	19.4	6,772	366	1,003	1,331	249	181.6	10.6	49.8	25.4
Texas Gulf Coast	1,820	859.9	122.9	399.3	233.8	25,430	2,296	7,017	4,350	1,690	813.3	107.8	365.4	239.5
La. Gulf Coast	651	336.1	53.7	141.9	40.8	11,260	1,548	3,439	1,347	548	260.5	52.9	133.4	45.7
N. La. and Ark.	84	28.7	9.3	19.3	6.9	4,419	711	1,245	97	83	30.7	7.5	19.9	5.9
Rocky Mountain:														
New Mexico	20	11.3	1.0	3.0	2.9	164		82	33	17	11.0	0.7	2.9	2.3
Other Rocky Mtn.	232	104.1	5.3	56.0	29.7	8,149	216	1,899	686	211	108.1	2.8	51.8	36.0
California	1,019	459.9	7.2	172.3	383.6	21,755	300	8,412	24,259	1,025	412.2	5.6	141.8	361.4
April 22, 1955	7,099	3,424.9	321.4	1,483.1	1,143.6	179,741	20,429	65,678	44,619	6,811	3,297.8	322.2	1,373.9	1,140.5
April 15, 1955	7,131	3,431.0	311.0	1,548.7	1,146.6	181,864	19,451	63,360	44,741					
April 23, 1954	6,812	3,331.3	307.9	1,345.4	1,194.4	178,033	18,518	58,932	43,779					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

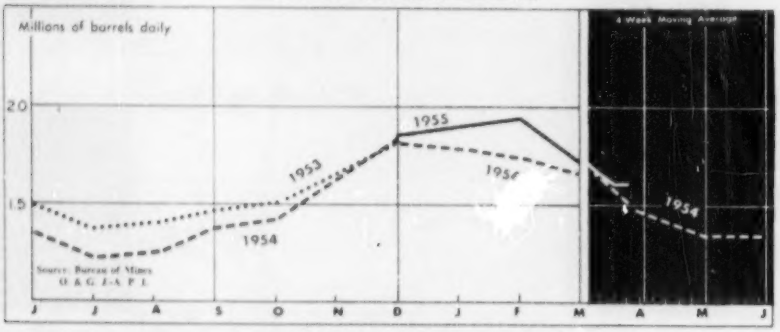
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of April 27, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	11.75-12.5	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.5-9.75	10.4	9.0-9.5
No. 2 straw fuel oil	8.75-9.0	9.65	8.5-9.0
No. 6 residual	$1.60-1.65	$2.35-2.45	$1.95-2.00

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Group 3 gasoline price increase, expected about April 15, was about a week late. Most of the Group 3 spot material is now moving at 10.75 cents. Group 3 residual is tighter. Allowance of 0.3 cent on kerosine and distillate is now general in New York Harbor. Light fuels softened on the Gulf Coast.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four wks. ended 4-22-55	3,400	3,672
January 1955	3,639	3,192
March 1954	3,261	3,331
April 1954	3,298	3,547
Middle distillate:		
Four wks. ended 4-22-55	1,898	1,750
January 1955	2,148	3,000
March 1954	1,811	2,235
April 1954	1,696	1,592
Residual fuel:		
Four wks. ended 4-22-55	1,154	1,608
January 1955	1,235	1,908
March 1954	1,169	1,664
April 1954	1,141	1,479

GASOLINE CONSUMPTION BY STATES*

(Thousands of gallons)

	1954	1953
Alabama	763,013	726,091
Arizona	326,657	321,400
Arkansas	484,264	463,030
California	5,256,338	4,874,567
Colorado	568,070	540,433
Connecticut	634,964	609,965
Delaware	129,709	127,436
District of Columbia	200,979	204,230
Florida	1,233,863	1,138,973
Georgia	1,022,637	972,853
Idaho	239,151	233,142
Illinois	2,634,688	2,544,995
Indiana	1,525,433	1,497,229
Iowa	1,064,848	1,028,229
Kansas	976,865	882,165
Kentucky	725,955	686,466
Louisiana	738,007	692,564
Maine	275,285	264,702
Maryland	709,168	677,952
Massachusetts	1,123,590	1,070,507
Michigan	2,264,967	2,223,296
Minnesota	1,092,061	1,044,388
Mississippi	544,094	520,935
Missouri	1,466,087	1,401,887
Montana	267,428	257,314
Nebraska	549,950	531,662
Nevada	112,450	105,815
New Hampshire	161,614	153,423
New Jersey	1,677,573	1,587,990
New Mexico	311,375	303,828
New York	3,292,483	3,134,505
North Carolina	1,149,504	1,144,530
North Dakota	297,130	291,319
Ohio	2,709,054	2,619,300
Oklahoma	824,759	811,757
Oregon	582,151	572,506
Pennsylvania	2,663,722	2,604,209
Rhode Island	217,368	201,115
South Carolina	590,422	588,434
South Dakota	323,114	308,803
Tennessee	922,078	878,644
Texas	4,462,293	4,613,630
Utah	268,159	257,562
Verdmont	114,168	112,174
Virginia	1,060,753	1,047,179
Washington	807,735	795,594
West Virginia	430,642	417,239
Wisconsin	1,144,721	1,132,764
Wyoming	158,954	155,316
Total U. S.	51,100,293	49,374,047

*A.P.I.

(The schedule of selected crude prices appeared on page 198 of April 25 issue and will be printed again next week).

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 25c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$16.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

GAS METERS: Westcott and Foxboro Orifice Meters and Controllers. Bristol and Taylor Recording Pressure Gauges. GEO. E. MILNER, P. O. Box 124. OKMULGEE, OKLAHOMA.

N-4 BREWSTER Single Drum Drawworks with one WAK Waukesha Engine—Less than 3 years old—Excellent condition—$11,000.00 —Contact Dick Schriber, Iverson Supply Company, Phone 7-2349, Odessa, Texas.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted —max. discharge pressure 100 lbs.—6" suction—8" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 3, Md., Curtis 7-5050.

FOR SALE: Two R. L. Cardwell Double Drum Spudders with derrick type masts. Would sell complete with Dog House, Light Plant, Wirelines, and Tools or with any part of them. Write Box 871, Seminole, Okla.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE

Three complete drilling rigs, depth range 4000 Ft. to 16,000 Ft., trucks, cars, and tool yard with dwellings. Rigs now operating in West Texas.

CALL 3-3552 OR 4-8145, MIDLAND, TEXAS.

USED EQUIPMENT

#527—Franks Model 44-TM, Single Drum, Truck Mounted Servicing Unit, 8x10x50' Single Pole Mast, Mounted on FWD Truck.

#536—Franks Model E.T. Single Drum Servicing Unit, 8x10x62' Single Pole Mast, Mounted on 1941 R8-F International Truck.

#526—Franks Super East Texas Double Clutch, Single Drum, Mounted upon KS-11 International Truck. No Mast.

#541—Franks Model ET Single Drum with 8x10x62-ft. Mast, Mounted upon 1948 Model K8 International Truck.

#517—Type 3 O.C.S. Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

#525—50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.

#533—Cardwell KL Double Drum Spudder with 60 ft. derrick.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: Nearly new S 33 Walker-Neer Spudder. Box H-702, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Surplus Walworth LimiTorque Motor Control Valves, 4" thru 18". Details furnished on request. Write, wire or phone Purchasing Agent, Texas City Refining, Inc., P. O. Box 1271, Texas City, Texas. Ph. 5-4451.

FOR SALE—At our Oklahoma City warehouse: 1 used 2½"-5" x 10" Gaso power pump, figure 710-S, serial No. 7435 on steel base and V-belted to HXE Hercules motor, serial No. 3330493. Price $1500.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

FOR SALE—At our Oklahoma City Warehouse: 1 used 2½"-5" x 10" Fig. 1450 Wheatley power pump, Ser. WBM 2060, mounted on steel base & DC to Buda BTH motor, Ser. No. 226569A. Price $1500.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

ATTENTION OIL INDUSTRY

(Operators, Producers and Drillers)

FOR SALE
$100,000.00 Inventory Drilling Tools
At 35% OFF

REED CORE KINGS
Cutter Heads and Core Catchers
Sizes from 5⅞" to 8½" both Hard and Soft formations for K-500 to K-675 barrels, complete with K-36A 2 piece Core Catcher.

REED CUTTERS
(For Wire Line Coring)
Sizes from 7⅞" to 9⅞", both Hard and Soft formations, both Pin and Box connections for all type barrels.

H. C. SMITH, SECURITY AND REED ROLLER ROCK BITS
Sizes from 5⅞" to 9⅞", Soft, Medium and Hard formations. Includes some Jet Bits.
All materials guaranteed factory new, manufactured 1952. No leasing agreement required. Write for detailed list and prices.

B. E. Cowan & Associates
Box 228 Elizabethtown, Kentucky

Reconditioned

STEEL PIPE

18,000 Feet
8⅝" O.D.—.322" Wall
5,000 Feet
10¾" O.D.—.365" Wall
18,000 Feet
12¾" O.D.—.375 Wall
2,500 Feet
14" O.D.—.375 Wall
Plain Ends—20 Ft. R.L.
Ideal for Gas, Water, Oil or Structural Purposes

Special Low Prices
IMMEDIATE SHIPMENT

BROWN-STRAUSS CORP.
1546 Guinotte—Kansas City, Mo.
PHONE—HA 1000

FOR SALE EQUIPMENT

CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

MAYHEW HEAVY DUTY 1000 Air and Water Combination Drills. Also truck mounted Schram Air Compressors, water trucks and pickups. All equipment guaranteed first class condition. Write P. O. Box 127, Lovington, New Mexico. Phones 8533 or 3791.

AIRCRAFT PARTS & REPAIRS
Mr. Aircraft Owner: Take advantage of our extra special service and vast inventories of Parts, ENGINES, PROPELLERS, TIRES and Supplies. Domestic and Foreign shipments. C A A approved repair station No. 3846.

VESTCO
Dept. L, Box 5306 T A
Denver 17, Colo.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

USED DRILLING RIGS COMPLETE

1—250 Bethlehem Draw Works with two 225 HP LeRoi compounded engines, 21" Bethlehem Rotary and 7½x14 Pump, 129 ft. Moore Jack Knife Derrick with 6 ft. substructure 150 ton BJ Block and Hook.
5200 ft. 4½" Full Hole Drill Pipe, Hughes Joints unitized 6-4-6 Water Pump with Ud International Engine Rig complete with Light Plant, Shale Shaker, Steel Pipe Racks, two Tool Houses, Tongs, small tools, Drilling Line, Hose, etc. Located East Texas.
1—National 50A Rig Complete with two 325 HP Superior Gas Engines, Lee C. Moore Derrick.
8,000 ft. 4½" Drill Pipe—Rig 2 years old. Located West Texas.
1—National 50 Rig Complete with 3 NKU Waukesha engines, stand by pump, steel slush pits, 8,000 ft. 4½" Drill Pipe, Lee C. Moore Jack Knife Derrick, Heavy Blow-out preventors—Rig 5 years old. Located West Texas.

WRITE, WIRE OR CALL—

Southern Oilfield Material Company
505 N. Ervay St.
Dallas, Texas
RIverside-1073

FOR SALE: ENGINE—165 Hp. Climax Model H81, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

FOR SALE—At Oklahoma City warehouse one 2" x 3" Gaso Fig. 3384 Horiz. Triplex Plunger Pump fitted for salt water service, driven by 5 HP 3 phase geared motor. Used approximately 18 months. Price $750.00. Contact T. P. Mace, Oklahoma City Warehouse, or Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE—At Oklahoma City: 6—200 HP G-MA Bessemer Type 10 gas engine compressor units, equipped with 17" x 20" Bessemer or Baash-Ross overhead exhaust power cylinders and 7" or 8" x 20" high and 14" x 20" low compressor cylinders, $3500.00 each as is. Contact T. P. Mace, Oklahoma City warehouse, or Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

USED DRILL PIPE

11,000' 3½" 13.30# Grade E with 3½" Internal Flush Weld Tool Joints: Price $1.60 per foot.
8,000' 4½" 16.60# Grade E with 4½" Full Hole Flush Weld Tool Joints: Price $1.35 per foot.

HARRIES SALES & RENTALS, INC.
Phones: 7-5032 Night 7-5002
P. O. Box 1568 Odessa, Texas

NEED A PIPE LINE

Have 800 Miles 8" Line Pipe

we are taking up through Illinois, Indiana, and Ohio. Will furnish pipe, go in on a deal, or finance.

We are open for any kind of deal.

REDNEB PIPE CO.

P. O. Box 1798 Shreveport, La.
Phone 2-3276

LIQUIDATION

GAS COMPRESSION RECYCLING PLANT

5—600 HP IR Type KVG Gas Engine Driven 2 stage Compressors (1942).
1—660 HP IR Type KVG Gas Engine Driven 2 stage Compressor (1952).
$50,000 New Spare Parts for above.
2—IR Starting Air Compressors, Model 25C, Type 40, 265#, 67.6 cfm.
3—2400 sq. ft. Adm. Exchangers.
3—150# Vessels, 10'x20', 8'x16', 6'x20'.
4—Centrifugal Pumps 200 gpm, 90' hd., 60 gpm, 460'.

WIRE! PHONE! WRITE!

LIQUIDATION LEVELLAND, TEX.

TOWERS: 6'x58' chrome-lined (1951), 6'6"x65', 6'x27', 5'x27', 42"x49', 30"x38.'
HEAT EXCHANGERS: (2) 800 sq. ft. (675# 800° F.) Steel.
VESSELS: 3'10"x38', 325#, 950° F.; 3'3"x 38'6" (90# 845° F.) chrome-lined.
PUMPS: BJ5-St. ni.-chr. pump 2100' hd., 400 gpm. IR 15x7x14 steam driven comp.
MISCELL.: Steel, chrome, pipe, valves and fittings, etc.

AVAILABLE ELSEWHERE

7'x26' SS, 7'6"x56' Towers.
7—742, 471, 424, 339 Adm. Exchangers.
10—1500, 1000, 360, 260 sq. ft. Steel Heat Exchangers.
6—325# Vessels 10'x35', 7'x30', 4'x40'.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, Locust 1351
New York Office, 2401 Third Ave.,
New York 5, N. Y.
Telephone Cypress 2-5703

Sell us your surplus equipment

FOR SALE EQUIPMENT

SULLIVAN 200 complete with tools ready to work, located Tulsa, Oklahoma. Contact R. F. Meaker, 1129 E. 15th St., Phone 4-9483.

8⅝ PIPE 28.55# with collar & P.E. $1.00; also 25 miles of P.E. beveled Rg 3. Ten miles 6⅝ P.E. 19# 75 Cents. R. L. Griffin, Box 2373, Phone 50-0848, Tulsa.

FOR SALE—Unit Rig Model U-15, available now, Wyoming. For inventory and price write Box H-769, The Oil and Gas Journal, Tulsa, Oklahoma.

FAILING 2500 Trailer mounted. Also Failing 1500 Truck mounted. Both rigs complete with drill pipe, winch trucks, and tools. For inventory of equipment and price, write M & G Drilling Co., P. O. Box 42, Guymon, Okla.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered on 3" C.C., now located in southwest, available for inspection. 11 Sperry 18" x 18" cast iron Filter presses. 11 chambers. Consolidated Products Co. Inc. #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

FOR SALE: Two Fort Worth Spudders. One Super J complete, Tools 15½" Down. One Jumbo J Complete, Tools 18" Down. For Sale or Trade—13⅜", 10¾", 8⅝" Casing —Also Miscellaneous Tools and equipment. Don L. Choate, Box 310, Cisco, Texas. Telephone 219.

BAILEY BRIDGES

Portable pre-fabricated steel sectional truss bridges to suit span and loading. Excellent for remote or foreign areas requiring access for drill rigs. Fast cantilever erection. Fully engineered. Proven utility. Sales or rentals.

Bailey Bridge Equipment Co.
1343 Chorro St., San Luis Obispo, Calif.

SPECIAL PIPE SALE

135,840 feet
8" O.D.—28.55 lbs. per ft.
24,870 feet
12" O.D.—49.56 lbs. per ft.
20' Random Lengths
Reconditioned Steel Pipe
Machine cleaned, straight
Beveled for Welding
SPECIAL DEALER PRICES

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION

2nd and Riverview (X-228)
Kansas City 19, Kansas
ATwater 9305

FOR SALE AT TREMENDOUS SAVINGS TO USERS OR DEALERS, THE ITEMS BELOW ARE NEW, PRIME, DOMESTIC MANUFACTURE,
Sell All or Part

200 ea. 16" WN, 300#, Sch. 40 Flanges, RF
125 ea. 24" WN, 300#, Sch. X Strong Flanges, RF
6 ea. 24" Blind, RF, Ser. 30
42 ea. 24" FS Orif. RF, Ser. 30, SO, Sch. 30
9 pr. 24" FS Orif. RF, Ser. 30, WN, Sch. 30
544 ea. 2" WN 300# RF, Sch. 80
354 ea. 6" WN 300# RF, Sch. 80
3000 ea. 2" Rola Grip Couplings
2000 ft. 14" OD x ⅜" wall, new, seamless A53 plain end, bevelled for welding
225 ft. 14" OD x ½" wall, new, seamless A55, p.e.
400 ft. 12¾" OD x 1" wall, new seamless, A106, p.e.
100 ft. 10¾" OD x 1" wall, new, seamless, A53

Write, wire or call

Baron Iron & Equipment Co.
722 Oliver St. N. W., Atlanta, Ga.,
Atwood 2721

FOR SALE EQUIPMENT

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

BIGNALL-KEELER pipe threading machine, Landis quick-change head, 5 H.P. electric motor. Lots additional dies, 2" to 8" skid-mounted. $1200.00. 3506 West Pikes Peak, Colorado Springs. G. M. McLaughlin.

STANDARD RIG front for cable tool drilling GAK Waukesha motor with Ensign carburetor, 15 hours since overhaul, located Longmont, Colorado. $3500.00. G. M. McLaughlin, 3506 West Pikes Peak, Colorado Springs.

FOR SALE: Medium and small rotary rigs ready to work, priced right for sale. For further information contact, Box H-778, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—In Madison, Kansas district 3 Model GB Superior 2 cylinder vertical gas engines, 7½" x 8" with clutch, and 7 Model MC Weber 7½" x 9" DO. $350.00 each. These have been operating geared pumping units supplying water for waterflood. Cities Service Oil, Patridge, Bartlesville.

FOR SALE

New Bolted Steel Tanks, Complete. Export Packed in Original Boxes.

100-Bbl. 1 Ring, Cone deck.
250-Bbl. Low, 1 Ring, Cone deck.
500-Bbl. Low, 1 Ring, Cone deck.
Extra steel and hardware available to make 500 or 1000-Bbl. high sizes. Subject to Prior Sale.

R. H. Tecklenborg Co.
609 South Grand Ave.,
Los Angeles 17, Calif.
Phone MAdison 6-2307

FOR SALE

1 Caterpillar generator, A.C., 15 K.W.
1 Century generator, D.C., 10 K.W.
1 General Electric generator, D.C., 10 K.W.
1 Westinghouse, D.C., 10 K.W., generator.
1 Kohler electric plant, D.C., 1½ K.W., 4 cylinder.
1 Kohler electric plant, D.C., 5 K.W., 4 cylinder.
1 Kohler electric plant, 5 K.W., Waukesha motor, F.C.-140.

All in excellent condition, may be seen at Makin Yard, Hobbs, New Mexico, or call 3-4062 or 3-3141.

MAKIN DRILLING COMPANY
P. O. BOX 1628
HOBBS, NEW MEXICO

FOR SALE

COMPLETE UNIT 15 DRILLING RIG

INCLUDES

Unit 15 drawworks with hydraulic brake, powered by 2 sets General Motors twin sixes, all in one unit.

133' Ideco Clearview Jackknife Derrick.

8"x16" Bethlehem Power Driven Pump.

7½"x12" Bethlehem Pump powered by General Motors Twin 4 Motors.

2—10¾" QRC Blowout Preventors.

6—6" Drill Collars.

8500' Drill Pipe with Super Shrunk Tool Joints.

Tools and accessories to make a complete drilling rig. All in first class condition and priced reasonable. Located in East Texas.

Vernon Whiteley
PHONE 2-2212
BRYANT PET. BLDG.
TYLER, TEXAS

FOR SALE EQUIPMENT

100,000 OKLA. Completion cards filed in ASE Cabinets. $2500. Box H-776, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—At Madison, Kansas, a large number of 250 bbl. and smaller wood oil storage tanks suitable for same use or for water in flooding. Can be moved as is. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: Three type 80 Cooper Gas Engine Compressors completely rebuilt. Two type 80 Cooper Compressors as is. One 100 H.P. Superior as is or rebuilt. One Clark 100 H.P. Gas Engine driven Compressor. W. S. Smith, 205 Thompson Bldg., Tulsa, Okla.

FOR SALE—Wilson Giant Rig, available now, Wyoming. For inventory and price write Box H-770, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, and abandoned leases. Gore Oil Field Supplies, Box 1063. Phone 3-6866 or 6-9747, Tulsa, Oklahoma.

WANT TO BUY—Bucyrus-Erie 28L, trailer mounted. No lines or tools. Must be in good condition and priced right. Kirby Oil Industries, Inc., Box 37, Elmwood Station, Omaha, Nebr. Tel. REgent 0600.

WANTED: Small rotary drill to drill approximately 300 to 500 feet. Box 400, Great Bend, Kansas.

WANTED

Eight inch pipe threading and cutting machine, Landis Heads preferred, for plumbing and heating contractor's shop.

BOX H-761,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

WANTED

Late model power drilling rig capable of drilling to 9,000 feet, located in Oklahoma, Texas or New Mexico. Send complete inventory and price to

Box H-731, The Oil and Gas Journal
Tulsa, Oklahoma.

HELP WANTED

LANDMAN for employment in division office of aggressive independent oil company. Two to five years' experience required. Location Denver or Billings. Salary commensuraie with experience and qualifications. Send detailed personal history, work experience, and choice of location to Box H-777, The Oil and Gas Journal, Tulsa, Oklahoma.

EXCEPTIONAL OPPORTUNITY for Graduate Petroleum Engineer, under 35, with Independent Oil Company. Should have at least three years' experience in the gulf coast, northern Louisiana, and West Texas areas. Must be outstanding in work-over analysis, economic evaluation, reserve calculations, electric analysis interpretation and reservoir studies. P. O. Box 2775, Dallas, Texas.

PETROLEUM ENGINEER OR GEOLOGIST

with broad general knowledge of the petroleum industry in East Texas, North Louisiana and South Arkansas to fill position with well established firm in area. State qualifications in detail.

Box H-705, The Oil and Gas Journal.
Tulsa, Oklahoma.

PETROLEUM ENGINEER WITH OPERATING EXPERIENCE TO ESTABLISH PRODUCING DEPARTMENT

Small new oil company, financially strong, wants graduate petroleum engineer with operating experience in Gulf Coast, to establish and manage producing department.

Headquarters Houston, salary open.

Write, giving experience, education, and age. Enclose a photograph, if possible. Include present address and telephone number.

All applications will be treated as confidential.

BOX H-760,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WANTED: GEOLOGIST and a Petroleum Engineer by major gas transmission firm in the Southwest for evaluation work in Mississippi, North and South Louisiana, and Texas (excluding West Texas). Box 774, The Oil and Gas Journal, Tulsa, Oklahoma.

PUBLIC RELATIONS Dep't., large progressive industrial concern in Houston, Texas, needs young, versatile, experienced writer and all-around PR ass't. Requirements: newspaper background, good education, pleasing personality, proven ability, age 26-36. Oil or financial writing experience would be helpful. Highly respected company. Real opportunity. Send complete resume, photograph, salary requirements. Confidential. Box H-772, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGISTS

5 to 10 years experience, knowledge of Spanish language, to work in Bolivia, South America.

Write to:

Y.P.F.B., Room 602
1026 17th Street, N.W.,
Washington 6, D. C.

HELP WANTED

OIL INDUSTRY Employment Service, Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. For technical and trained oil industry personnel.

GEOLOGIST of outstanding ability, under 35, with at least 3 years' experience in northern Louisiana, gulf coast, and west Texas areas. Exploration and development experience essential for Dallas office of established independent oil concern. P. O. Box 2775, Dallas, Texas.

ESTIMATOR

NEW YORK OFFICE

To prepare preliminary estimates of material, labor & engineering, etc. for foundations, buildings, steel, piping, electrical, equipment & instrumentation for petroleum refineries and/or chemical plants.

Challenging opportunity for qualified estimator with minimum 5 years specific experience as referred to above, preferably with contracting engineering firm.

Airmail confidential verifiable chronological resume highlighting specific petro-chem estimating experience, including salary history & salary request, to

PERSONNEL DEPARTMENT:

HYDROCARBON RESEARCH, INC.

115 Broadway New York 6, N. Y.

MANAGERIAL PERSONNEL NEEDED

For Research Centre in The Petroleum Industry

Ente Nazionale Idrocarburi (E.N.I.) has under its supervision a number of Italian Companies active in the field of petroleum and petrochemicals. ENI's major activity is centered in the following items:

- gas and oil field exploration and exploitation (current production: 105 billion cu. ft. of natural gas per year);
- operator of a 2500-mi. pipe-line system (capacity over 700 million cu. ft. per day);
- owner and operator of a tanker fleet of around 120,000 dwt;
- owner and operator of an extensive network for distribution of petroleum products and LP-gas throughout Italy (64 Bulk plants, 4000 stations, etc.);
- control over or shareholding in refineries having a processing capacity of about 6 million tons of crude oil per year;
- owner of factories (1500 employees) for construction of machinery;
- shareholding of chemical plants (700 employees) for production of synthetic dyes, detergents, etc.;
- under construction, a petrochemical plant (production capacity—30,000 tons per year of synthetic rubber and 350,000 tons per year of ammonium nitrate).

E.N.I. is organizing a big research center for investigation and development of petroleum processing and manufacture of petrochemicals. Some departments are expected to begin operation next summer.

Italian or foreign technical experts, with a wide educational background, specific training, organizational and managerial ability, are required to fill positions as heads of the main departments of the laboratories.

Specifically the following are sought:

1) Chemist or physicist with specific knowledge and experience in thermodynamic and chemico-physical problems;
2) Chemist specialized in the preparation of organic compounds particularly those derived from hydrocarbons;
3) Inorganic chemist soundly and completely acquainted with modern methods of experimentation, research and testing;
4) Engineer or industrial chemist specially trained in the methods for improving petroleum products applications;
5) Engineer or physicist, with physico-technical and technological training, specialized in the problems of thermo-technics, measurements and controls;
6) Engineer or industrial chemist with extensive research experience in the field of crude oils processing;
7) Engineer or industrial chemist particularly experienced in extending laboratory procedures to pilot plants;
8) Engineer with good theoretical knowledge and laboratory experience in engine tests on fuels and lubricating oils;
9) Engineer or industrial chemist specially trained both in theory and practice in the fields of corrosion and protective means for materials.

Note: University degree mandatory.

Applications should state age and other usual personal data, educational background and qualifications, practical experience, etc. and should include a photograph. Please address personally to the: **Presidente dell'Ente Nazionale Idrocarburi, Via Lombardia, 43 - Roma - Italy,** with the special note **RISERVATA PERSONALE** (i.e., to be opened by addressee only).

Absolute discretion in every respect is assured.

Salary offered will be in accordance with position, training and qualities required.

HELP WANTED

PROJECT ENGINEER

To supervise the design and correlate the engineering, drafting, purchasing and construction of a plant to produce ammonia.

Your reply should include a resume of experience, education and references and be addressed to the Personnel Manager.

J. F. Pritchard & Company

4625 Roanoke Parkway

Kansas City 12, Missouri

SALESMAN for Houston area. Must be familiar with drilling equipment and know local contractors. Excellent opportunity. Replies will be held confidential. Box H-781, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER, 6 to 8 years experience with emphasis on refinery or petrochemicals. Initial letter application should set out experience in detail, education and salary requirements. Texas location. Box H-748, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES SERVICE

PETROLEUM CHEMICALS

B.S. or M.S. Chemist or Chemical Engineer for combination development laboratory and sales service work. 3 - 5 years refinery laboratory or manufacturing experience in light oils required. Will involve some travel with headquarters at Kingsport, Tennessee. Salary open. Send resume to:

SUPERINTENDENT OF PERSONNEL,

Eastman Chemical Products, Inc.

Kingsport, Tennessee

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi-Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 40

ARABIAN AMERICAN OIL COMPANY

505 Park Avenue

New York 22, N. Y.

HELP WANTED

MAN TO RUSTLE drilling and production deals. Geological, land, or engineering background. Give reference first letter held in confidence. Remuneration commensurate with ability plus agreed participation percentage. Expect reasonable trial period pointing toward permanent association. Box H-740, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST

Wanted for Staff position in growing independent oil company in West Texas. Must be man of mature age and judgment with at least ten years of practical and successful oil finding experience in exploration and development geology. Should have administrative ability to organize and supervise the work of two or more district geological offices. Salary will be commensurate with experience and abilities. Preferable age limits 35 to 45. In replying please give complete personal and professional background and references. Small recent photo would be helpful. All applications will be treated in utmost confidence, but personal interview will be arranged only if data furnished is adequate and meets our requirements. Box H-691, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

CORROSION ENGINEER: 11 years experience in corrosion mitigation work dealing with transmission and distribution pipe lines, tank bottoms and lead-sheathed cables. Excellent references. Box H-775, The Oil and Gas Journal, Tulsa, Oklahoma.

CPA, University honor graduate, 33, family—diversified experience in public accounting, heavy in oil and gas taxation, concentrated private experience in refinery, production, and pipeline accounting seeks challenging position as controller, assistant controller or auditor. Available in sixty to ninety days. Box H-780, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire, or call collect for further information.

MAXIN DRILLING COMPANY

P. O. Box 1628, Hobbs, New Mexico
Phone 3-3141.

146 Allen Building, Midland, Texas.
Phone 2-2962.

SITUATIONS WANTED

PETROLEUM ENGINEER, 27, married, desires position in Rocky Mountain area with active independent. 4 years drilling, production, workover, evaluation and reservoir experience in Oklahoma and Texas. Box H-773, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, D.Sc., 33, surface and subsurface exploration, desires attractive foreign assignment. Box H-765, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPELINE SUPERINTENDENT, under 40, graduate engineer, desires change. Box H-767, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL, MAP, Engineering Draftsman Major Oil Co. and Government Experience. Desires farm-out work only. Maps, Well logs, Engineering Drgs., Bulletin lettering. Lois Caldwell, 1031 No. Quaker, Ph. 3-0488, Tulsa.

CHEMICAL ENGINEER, 6 years refinery engineering and operating experience. Box H-779, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

SETTLED OIL production wanted by independent operator direct from producer. P. O. Box 852, Oklahoma City, Oklahoma.

ROYALTIES

OFFERING AND BUYING Choice Oil and Gas Income Royalties, Oil Properties, Leases and Royalties ahead of drilling. Small Buyers Solicited. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

PIPELINES ANNOUNCED: Projected pipelines indicate increasing action in central Williston Basin, where we specialize in royalties in major company blocks. For informative material, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Mont.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

OIL OPPORTUNITY: I have Choice Leases to sell in Shallow Producing Area; Nowata Co., Okla., Radioactive Survey shows Potential Oil Trends. Write—F. W. Vishnefske, Salina, Kans.

320 ACRE LEASE—Small Hunton well, additional proven acreage Sabetha, Kansas for sale cheap. R. D. Swan, 818 Kennedy Bldg., Tulsa.

¾ DRILLING ASSIGNMENT off-setting Multiple Wilcox Sands, Tyler County, Texas. No cash. Prince Angelloz, 3008 Central, Port Arthur, Texas.

FOR SALE OR LEASE—Forty highly potential uranium claims, excellently located in geologically favorable Shinarump formation, commercial ore on same trend (N.W. Colorado) For sale or lease for moderate advanced royalty and drilling commitment. Box H-768, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

FOR LEASE

125 sections New Mexico, 60 mi. SW Hartley Co., Tex. Combined oil, gas & uranium, solid block, one owner. Well drilled 1926. Would be producer now under modern drilling technique. Have log and maps. Several known URANIUM deposits. PRICE: $1.50 per acre bonus, 50c rentals, net to owner, 10 year commercial lease.

COMBEST ROYALTY COMPANY

Amarillo, Texas

MAP STICKS

ELIMINATE YOUR MAP-HANDLING PROBLEMS! Simply roll your maps on Kraftbilt All-Plastic Snap-On Map Sticks and hold in place with light-weight resilient plastic clips. Bright colored Index Flags plug in one end of each stick, carry labeled identity and instantly "flag" the map you want. Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1 Oklahoma

MFG'S. AGENT

MANUFACTURERS AGENT with experience can work another oil-field production-equipment account in Oklahoma and Kansas. Box H-756, The Oil and Gas Journal, Tulsa, Oklahoma.

STRIP LOG CABINETS

MORE LOGS ARE FILED in Kraftbilt Strip Log Cabinets than all others combined. Loaded drawers glide smoothly on roller bearings. Three drawers per section, add sections as needed. Built to last a lifetime! Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

BUSINESS OPPORTUNITIES

ASPHALT—Consulting service on manufacture, paving, roofing asphalts and specialties; formulation, applications, Rheology and highway engineering. Box H-759, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Someone to Manufacture, and Sell, a New Pipe Line Valve, recently designed and developed to meet the increasing requirements, for simplicity, efficiency, and positive sealing. Write P. O. Box 404, San Marcos, Texas.

PETROLEUM SERVICE MANAGEMENT COMPANY, INC.
Commerce Building, Phone 2-9621. Abilene, Texas

Purchasing and management of proven oil and gas properties.
Representing clientele with assets over $200,000,000.
Will accept exclusive listings only.

PETROLEUM GEOLOGIST FOR INVESTMENT GROUP

Top executive, administrative, and technical experience in U.S.A. - Canada, graduate geologist, 16 years experience, Law School background, thoroughly experienced in evaluations, purchasing proven oil and gas properties, drilling deals, leases, fully qualified to organize company, taking complete management and supervision, seeking connection with group who do not have geologist, and who are attempting to get into the oil business. Should have minimum of $3,000,000 to purchase proven production at outset. Have several excellent properties set up to purchase, valuable contacts, information, and know-how. All correspondence treated strictly confidential. Personal Box H-746, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

REAL ESTATE

Summer Home in Colorado

Cool off in comfort this summer. 30 miles northwest Denver on South Boulder Creek and new lake now filling. Six bedrooms, 2 baths, fully furnished, gas, electricity, deep freeze, dishwasher, modern barn. For sale by owner,

J. D. VOORHEES,
801 Continental Oil Building,
DENVER 2, COLORADO

ADVERTISERS

Aircraft Components, Inc. 121
Alco Products, Incorporated 30, 31
Amercoat Corporation 12
American Iron & Machine Works Co. 146
Baird Mfg. Co. 147
Baker Oil Tools, Inc. 46
Beavers and Associates, V. L. 124
Berry Division, Oliver Iron and Steel Corporation 158
Bethlehem Steel Co. 10
Black, Sivalls & Bryson, Inc. 35
Braun & Co. C F 134
British Petroleum Company Limited, The 162
Butler Manufacturing Company 96
Cable Engineering 155
Charles Machine Works, The 124
Chase Brass & Copper Co. 104
Chicago Bridge & Iron Company 87
Classified Advertising 171, 172, 173, 174
Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division 17
Continental Can Company 48
Cooper-Bessemer Corp., The 88
Core Laboratories, Inc. 140
Crose Manufacturing Co., Inc., M. J. 118
Dean Brothers Pumps, Inc. 139
Dean Hill Pump Company 20
Delta Engineering Sales Co. 117
Dowell Incorporated 112, 176
Dragert Company, Inc., C. H. 40
Drilling & Service, Inc. 161
Duff-Norton Mfg. Co. 39
Dunham Tanks Division of Anderson-Dunham, Inc. 28, 29
du Pont 21, 22
Eastman Chemical Products, Inc. 25
Edward Valves, Inc. 123
Enardo Manufacturing Company 136
Ethyl Corporation 90, 91
Fairbanks, Morse & Co. 4
Federal Telephone and Radio Company 92
First National Bank & Trust Co. of Tulsa, The 124
Flangeklamp Corp. 121
Fluid Packed Pump Company 115
Foxboro Company, The 38
Franks Mfg. Corp. Inside Back Cover
Fulton & Company, R. H. 116
General American Transportation Corporation 44
General Electric Co., Electronic Dept. 13
Globe Oil Tools Company 122
Goodall Rubber Company 126
Goodrich Company, B. F. 5
Grancell, I. H. 123
Grove Valve and Regulator Company 11
Guiberson Corporation 106
Halliburton Oil Well Cementing Co. 9, 157
Helicoid Gage Division, American Chain & Cable Co. 133
Higgins Inc. 145
Huey & Co., S. E. 121
Hughes Tool Co. Back Cover
Inferno Co., The 124, 147
International Harvester Co. 16
International Nickel Company, Inc., The 149
International Paints (Export) Ltd. 134
Jacobson, Maas, E. C. 134
Johnson Motors 18
Johnston Testers, Inc. 27
Jones & Laughlin Steel Corporation Supply Division 14
Kellogg Co., The M. W. 15
Kennametal, Inc. 33
Le Roi Division of Westinghouse Air Brake Co. 8
Link-Belt Company 7
Manhattan Rubber Division, Raybestos-Manhattan, Inc. 108
Manning, Maxwell & Moore, Inc. 24
Mathieson Chemicals, Olin Mathieson Chemical Corporation 19
Mayo Hotel, The 120
McDonough Marine Service 124
Minneapolis-Moline 153
Nordstrom Valve Division, Rockwell Manufacturing Company Inside Front Cover
Olin Mathieson Chemical Corporation, Industrial Chemicals Division 19
Oliver Iron and Steel Corporation, Berry Division 158
Outboard Marine & Manufacturing Co. 18
Pacific Lumber Company, The 110
Pacific Pumps Inc. 42
Paris Distributor, Inc., Henry H. 37
Parkersburg Rig & Reel Co. 135
Peerless Supply Co. Inc. 121
Pritchard & Co., J. F. 43
Raybestos-Manhattan, Inc., Manhattan Rubber Division 108
Refinery Supply Co., The 139
Republic Steel Corporation 98, 99
R-P&C Valve Division American Chain & Cable 148
Rubber Teck, Inc. 150
Ryerson & Son, Inc., Joseph T. 154
Schlumberger Well Surveying Corp. 159
Shell Chemical Corporation 26
Shippers' Car Line Corporation A Subsidiary of ACF Industries Incorporated 34
Southwest Industries, Inc. 132
Technical Oil Tool Corporation 36
Texas Employers Insurance Association 125
Thomas Flexible Coupling Co. 151
Thornhill-Craver Co. 101
Timken Roller Bearing Company 33
Tuloma Builders, Inc. 120
United States Steel Corporation—Wilte Engine Works Oil Well Supply Division 6
United Supply & Manufacturing Co. 128
Valley Electric Corp. 150
Victor Products Corp. 134
Viking Pump Co. 155
Visco Products Co., Inc. 95
Wall Colmonoy Corporation 131
Waukesha Motor Company 160
Welex Jet Services Inc. 32
Well Equipment Mfg. Corp. 152
Western Company 41
Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp. 17
Williamson, Inc., T. D. 119
Wilte Engine Works Oil Well Supply Division, United States Steel Corporation 6

CANADA—ALBERTA

(Continued from page 156)

34 ft. higher than the discovery well, has opened up and tested 96 ft. of lime and is drilling ahead at 9,238 ft.

The well, H.B. 3-3-34-5 Sundre, is 60 miles north-northwest of Calgary and ½ mile east of the discovery well.

BRITISH COLUMBIA

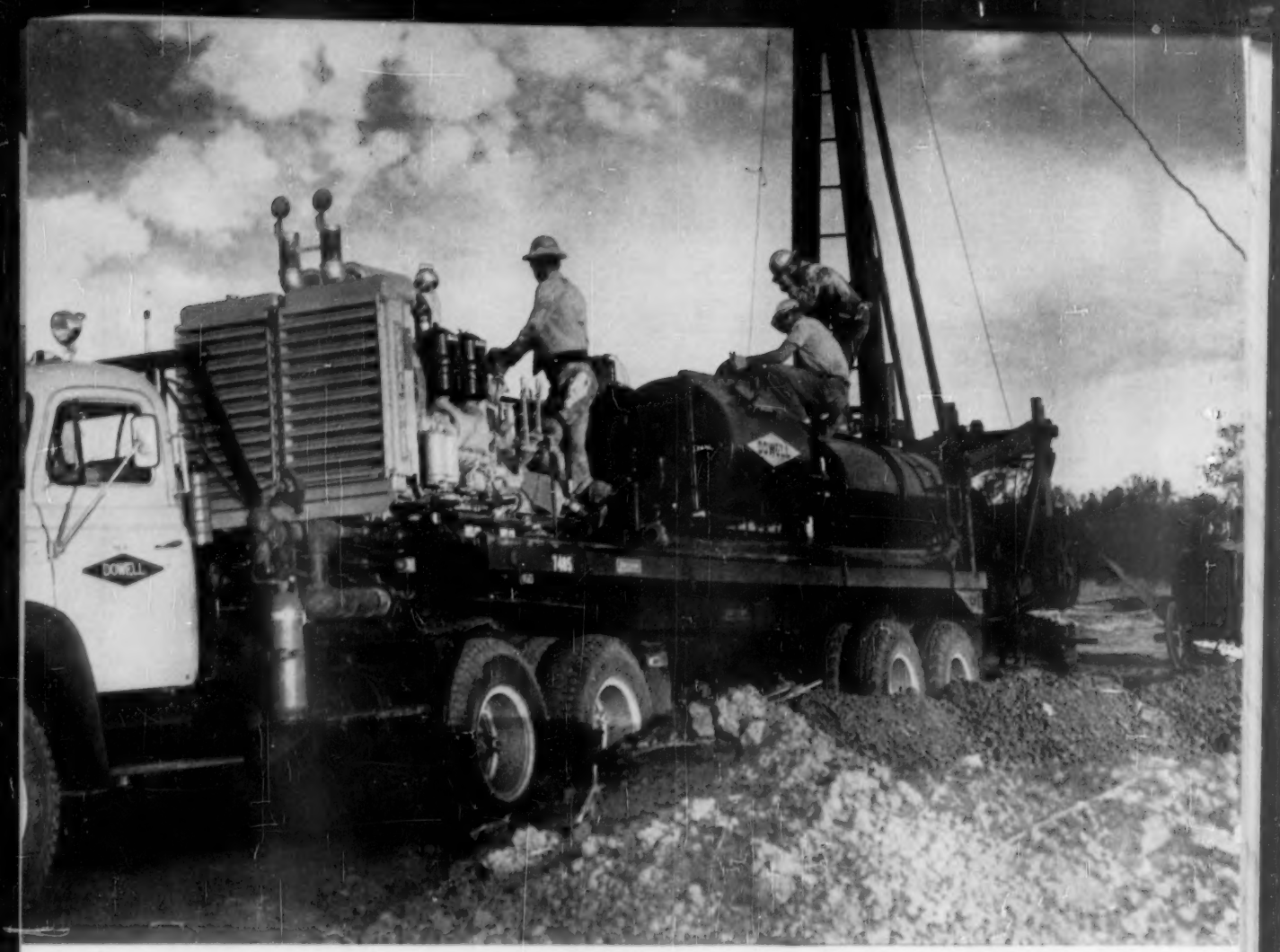
The Northern Foothills Agreement Group has completed its exploratory well in the Nig Creek area as a substantial gas producer from the Triassic. This venture is owned equally by Canadian Gulf, Texaco, Shell, and Socony-Vacuum, the four participants in the NFA group.

The well, Texaco-NFA 6 Nig Creek, located in unsurveyed territory at 57 degrees 5 minutes 39 seconds north Latitude, and 121 degrees 38 minutes 42 seconds west Longitude, is about 65 miles north-northwest of Fort St. John town and 4 miles northeast of the 1 Nig Creek Triassic gas discovery. Initial potential test was calculated at 4,400 M.c.f. per day on ½-in. choke.

BASIN AND RANGE

IDAHO

Oroco Oil & Gas Co. is drilling below 100 ft. at 1 Johnson, C SE 27-8n-4w, in the Payette area, Payette County. This operator has drilled two previous wells in this area, with good gas shows reported in shallow depths in both. Both these wells failed on commercial completion, however.



RETARDED ACID

DOWELL's delayed-action acid resulted in more effective acidizing far back from the well bore—boosted production 120 BOPD

After a treatment with 1000 gallons of regular acid, this well—completed in a fast-reacting limestone pay—limped along at 24 BOPD. The offset wells had been treated with regular acid three times each—but with no production increase over the first treatments.

The operator called in Dowell engineers. They recommended that the well be treated with 3000 gallons of *Retarded Acid*. As a result of this treatment, production promptly jumped to 144 BOPD.

Retarded Acid contains an additive agent which retards the reaction of the acid with the formation. This allows the acid to penetrate farther than ordinary acid before spending itself. Retarded Acid has proved effective in limestone or dolomitic formations that have fractured or vugular porosity.

By opening up the formation farther back from the well bore, Retarded Acid is designed to obtain better oil recovery—using less acid. For fast-reacting fractured or vugular limestone, Retarded Acid is your *best buy* today.

For more information or service, call any of the 165 Dowell offices in the United States and Canada—in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department E-11.

services for the oil industry DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

Satisfactorily Operating Under Tough Canadian Field and Road Conditions

REDWELL SERVICING COMPANY
LIMITED

TELEPHONES:
EDMONTON 3[illegible]
REDWATER - 60

J. V. DRUMHELLER
PRESIDENT
RES. 88888

GEORGE S. WARD
RES. 3[illegible]

OIL AND GAS WELL SERVICING

5823 - 103A STREET
EDMONTON

Feb. 26th, 1955.

Franks Mfg. Corp.,
P. O. Box 3218,
Whittier Station,
Tulsa 8, Oklahoma,
U.S.A.

Gentlemen:

Attention: Mr. S. E. Corry

We have been operating our Franks Senior Clipper for the past two years in Alberta under weather and road conditions that are just about as tough as they can get. It is a pleasure to be able to report that its performance on the whole has been very satisfactory.

Its manoeuverability and fast rigging up features have proven very popular and we have found the rig to be well rated as to capacity.

Yours very truly,
REDWELL SERVICING COMPANY LIMITED

J. V. Drumheller
J. V. Drumheller

JVD/dc

Franks Mfg. Corp.
Subsidiary of Cabot Shops, Inc.
Domestic and Export
Box 3218, Whittier Sta.
Tulsa, Oklahoma

STAR FEATURES OF FRANKS CLIPPER

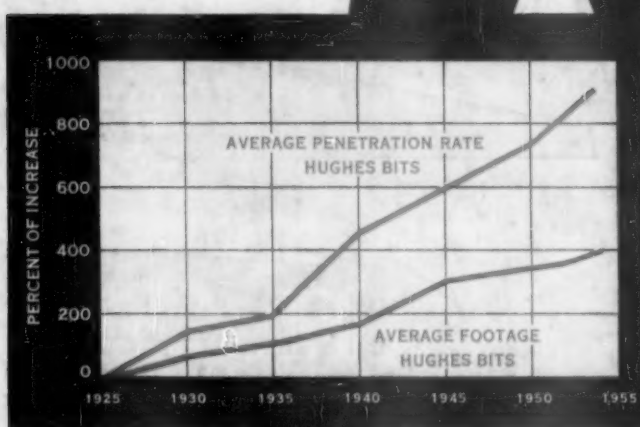
- **Latest approach to highway legality and perfect weight distribution.**
- **Easiest spotting as it heads into location instead of backing in.**
- **Up to 400 hp. Engine, rear-end mounted.**
- **Fastest operation with air lift rod transfer.**
- **Unobstructed operator's vision with Franks portable control console.**
- **Up to 300,000 lb. API capacity telescoping derrick.**
- **Minimum rigging as derrick raised and extended hydraulically; only guy lines to unit needed.**

FRANKS MFG. CORP.
WELL SERVICING AND DRILLING [illegible]
TULSA, OKLAHOMA

"on the SPOT" FIELD SERVICE

Only Franks offers "on the spot" field service, with stock of parts and factory-trained personnel available at: Alice, Compton, Casper, Farmington, Great Bend, Houston, Kilgore, Odessa, Seminole, Edmonton, and Tulsa.

Here's progress in penetration

You are drilling wells twice as fast as you did 15 years ago and over nine times as fast as you did 30 years ago. This big increase in penetration rate stems from many sources: greatly improved drilling equipment, development of new drilling techniques, and better rock bits.

Significantly, the gains in penetration rate, charted below, parallel the introduction of new Hughes bit designs: Acme self-cleaning cones in 1925; unit type bits in 1931; Tri-Cone bits in 1933; offset Tri-Cones in 1935; improved hard formation bits, such as the W-7R, in the early 40's; long-toothed OSC-3's in 1947; jet bits in the late 40's, and Hugheset bits in the early 1950's. For assured performance operators the world over are running HUGHES bits.